



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
REGION IX  
75 Hawthorne Street  
San Francisco, CA 94105-3901

May 9, 1995

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Certified Mail  
Return Receipt Requested

Jose Uranga, Esq.  
Legal Department  
Aerojet-General Corporation  
P.O. Box 13222  
Sacramento, CA 95813-6000

Re: Unilateral Administrative Order No. 95-16; In the  
Matter of American River Study Area.

Dear Mr. Uranga:

Enclosed is Unilateral Administrative Order No. 95-16 ("Order"), which requires Aerojet-General Corporation and Cordova Chemical Company ("Respondents") to perform the removal action described in the Action Memorandum issued by the Environmental Protection Agency, Region IX ("EPA") on June 30, 1994. EPA notified you on April 21, 1995, that it intended to issue the Order. EPA acknowledges that the Respondents are committed to implementing the American River removal action, and have already submitted certain of the deliverables required by the Order for government review. The enclosed Order provides an appropriate vehicle for continued government involvement in, and oversight of Aerojet's work.

Please do not hesitate to call if you have any questions or require additional information.

Very truly yours,

A handwritten signature in cursive script, reading "Marie M. Rongone".

Marie M. Rongone  
Assistant Regional Counsel

enclosure

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8 UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
9 REGION IX

10	IN THE MATTER OF:	)	ORDER NO. 95-16
11	AMERICAN RIVER STUDY AREA,	)	ADMINISTRATIVE ORDER
12	AEROJET-GENERAL SUPERFUND SITE,	)	PURSUANT TO SECTION 106
13	RANCHO CORDOVA, CALIFORNIA;	)	OF THE COMPREHENSIVE
14	RESPONDENTS AEROJET-GENERAL CORPOR-	)	ENVIRONMENTAL RESPONSE,
15	ATION AND CORDOVA CHEMICAL COMPANY )	)	COMPENSATION AND
16		)	LIABILITY ACT OF 1980
17		)	as amended, 42 U.S.C.
18		)	Section 9606(a)

1	I.	<u>INTRODUCTION AND JURISDICTION</u>	1
2	II.	<u>FINDINGS OF FACT</u>	1
3	III.	<u>CONCLUSIONS OF LAW AND DETERMINATIONS</u>	
4			6
5	IV.	<u>NOTICE TO THE STATE</u>	7
6	V.	<u>ORDER</u>	7
7	VI.	<u>DEFINITIONS</u>	7
8	VII.	<u>NOTICE OF INTENT TO COMPLY</u>	12
9	VIII.	<u>PARTIES BOUND</u>	12
10	IX.	<u>WORK TO BE PERFORMED</u>	14
11	X.	<u>SELECTION OF CONTRACTORS</u>	24
12	XI.	<u>PERFORMANCE STANDARDS</u>	25
13	XII.	<u>FAILURE TO ATTAIN PERFORMANCE STANDARDS</u>	25
14	XIII.	<u>ADDITIONAL RESPONSE ACTIONS</u>	26
15	XIV.	<u>ENDANGERMENT AND EMERGENCY RESPONSE</u>	27
16	XV.	<u>EPA REVIEW OF SUBMISSIONS</u>	27
17	XVI.	<u>PROGRESS REPORTS</u>	28
18	XVII.	<u>QUALITY ASSURANCE, SAMPLING AND DATA ANALYSIS</u>	29
19	XVIII.	<u>COMPLIANCE WITH APPLICABLE LAWS</u>	30
20	XIX.	<u>OFF-SITE SHIPMENT OF HAZARDOUS SUBSTANCES</u>	31
21	XX.	<u>REMEDIAL PROJECT MANAGER</u>	32
22	XXI.	<u>ACCESS TO SITE NOT OWNED BY RESPONDENTS</u>	34
23	XXII.	<u>SITE ACCESS AND DATA/DOCUMENT AVAILABILITY</u>	35
24	XXIII.	<u>RECORD PRESERVATION</u>	36
25	XXIV.	<u>DELAY IN PERFORMANCE</u>	37
26	XXV.	<u>ASSURANCE OF ABILITY TO COMPLETE WORK</u>	38
27	XXVI.	<u>REIMBURSEMENT OF RESPONSE COSTS</u>	39
28	XXVII.	<u>UNITED STATES NOT LIABLE</u>	40

1	XXVIII.	<u>ENFORCEMENT AND RESERVATIONS</u>	41
2	XXIX.	<u>LIABILITY FOR VIOLATIONS</u>	42
3	XXX.	<u>EFFECTIVE DATE AND COMPUTATION OF TIME</u>	43
4	XXXI.	<u>OPPORTUNITY TO CONFER</u>	43
5			
6			
7			
8			
9			
10			
11			
12			
13			
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15			
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3 I. INTRODUCTION AND JURISDICTION

4 This Order directs Aerojet-General Corporation and Cordova  
5 Chemical Company (collectively, "Respondents") to implement the  
6 removal action described in the Action Memorandum dated June 30,  
7 1994, for the American River Study Area ("ARSA") operable unit of  
8 the Aerojet-General site in Rancho Cordova, California. It also  
9 requires certain additional removal actions deemed necessary for  
10 the ARSA. This Order is issued to Respondents by the United  
11 States Environmental Protection Agency ("EPA") under the  
12 authority vested in the President of the United States by section  
13 106(a) of the Comprehensive Environmental Response, Compensation,  
14 and Liability Act of 1980, as amended ("CERCLA"), 42 U.S.C.  
15 § 9606(a). This authority was delegated to the Administrator of  
16 EPA on January 23, 1987, by Executive Order 12580 (52 Fed. Reg.  
17 2926, January 29, 1987), and was further delegated to EPA  
18 Regional Administrators on September 13, 1987 and October 26,  
19 1988 by EPA Delegations Nos. 14-14-A and 14-14-B.

20 This Order requires the Respondents to undertake and  
21 complete removal activities to abate an imminent and substantial  
22 endangerment to the public health and welfare or the environment  
23 that may be presented by the actual or threatened release of  
24 hazardous substances.

25 II. FINDINGS OF FACT

26 A. The Aerojet-General Site ("Site") is the site defined  
27 in paragraph 5(A)(2) of a Consent Decree entered June 23, 1989,  
28 in the United States District Court, Eastern District of

1 California, in the action United States of America v. Aerojet-  
2 General Corporation and Cordova Chemical Company and State of  
3 California, ex rel. John K. Van De Kamp and On Behalf of the  
4 State Department of Health Services and the Hazardous Substance  
5 Account, and on Behalf of the California Regional Water Quality  
6 Control Board v. Aerojet-General Corporation and Cordova Chemical  
7 Company, Civil Action Nos. CIVS-86-0063 EJG and CIVS-86-0064 EJG  
8 ("Partial Consent Decree"). The physical facility consists of an  
9 8,500 acre tract of land approximately 15 miles east of downtown  
10 Sacramento, California, bordered on the west by Folsom South  
11 Canal, on the South by White Rock Road, on the east by Prairie  
12 City Road, and on the north by Folsom Boulevard and U.S. Highway  
13 50. Less than one mile north of the Site, the American River  
14 flows westwardly.

15 B. Aerojet-General Corporation is the current owner and  
16 operator of the Site. Since 1951, Aerojet-General Corporation  
17 has used the Site for the development, testing and manufacturing  
18 of rocket engines for the U.S. space exploration and missile  
19 programs.

20 C. Cordova Chemical Company is a wholly-owned subsidiary  
21 of Aerojet-General Corporation. Cordova Chemical Company  
22 manufactured paint components, herbicides and pharmaceutical  
23 products at the Site between 1977 and 1981.

24 D. Throughout the operation of the Site, Respondents have  
25 disposed of large quantities of wastes at the Site containing  
26 hazardous substances, including rocket propellants, herbicides,  
27 organic solvents, inorganic compounds, and sewage, by burial,

1 open burning, discharge into unlined ponds, and injection into  
2 deep underground wells.

3 E. The Partial Consent Decree requires Respondents to  
4 perform a Remedial Investigation/Feasibility Study ("RI/FS") at  
5 the Site. Pursuant the RI/FS work, EPA, Respondents, the  
6 California Department of Toxic Substances Control ("DTSC"), and  
7 the California Regional Water Quality Control Board ("RWQCB")  
8 have discovered over 250 possible locations where organic and  
9 inorganic contaminants from Respondents' operations have seeped  
10 into the soil, surface water, and groundwater. Over 100  
11 contaminants have been detected both on and off Respondents'  
12 property. Primary contaminants of concern include the volatile  
13 organic compounds ("VOCs") trichlorethylene ("TCE"),  
14 perchloroethylene ("PCE"), 1,1-dichloroethene ("DCE"), vinyl  
15 chloride, freon-113, and the semi-volatile organic compounds 1,4-  
16 dioxane and nitrosodimethylamine ("NDMA").

17 F. The removal action that is the subject of the Action  
18 Memorandum and this Order addresses the plume of hazardous  
19 substances migrating from the Site toward, beneath, and to the  
20 area north of the American River ("American River North Removal  
21 Action"). In 1990, Respondents installed monitoring wells north  
22 and south of the American River. In 1991, sampling of these  
23 wells confirmed that chemicals, including TCE, 1,1-DCE, Freon-113  
24 and perchlorate had moved in the groundwater to the area north of  
25 the American River. TCE is the most prevalent of these chemicals  
26 and has been detected at concentrations up to 4,550 parts per  
27 billion ("ppb"). The Federal Maximum Contaminant Level ("MCL")



1 | for TCE is 5 ppb.

2 |       G.    Respondents presented this information to EPA, DTSC and  
3 | the RWQCB ("the Agencies") in a Revised Scoping Operable Unit  
4 | Analysis Report in 1991 ("OUA"). The Agencies disapproved the  
5 | OUA, and Respondents subsequently developed and submitted to the  
6 | Agencies a Focused Operable Unit Conceptual Work Plan and  
7 | Schedule ("OUC"). The Agencies approved the OUC in February  
8 | 1992.

9 |       H.    Based on the findings of the OUA and OUC, the Agencies  
10 | determined that a plume of contaminants has migrated beneath the  
11 | American River to the area north of the American River. The  
12 | Agencies further determined that without intervention, the plume  
13 | could continue moving down-gradient and reach the Fair Oaks  
14 | drinking water supply wells prior to the completion of an RI/FS  
15 | and the implementation of the selected remedial action. The  
16 | American River is also in danger of becoming contaminated.

17 |       I.    Accordingly, the Agencies determined that a non-time-  
18 | critical removal action was warranted, and that an Engineering  
19 | Evaluation/Cost Analysis ("EE/CA") should be prepared to evaluate  
20 | alternatives for a removal action to address the migration of  
21 | contaminants to the area north of the American River.

22 |       J.    In May 1993, Respondents submitted the EE/CA, which was  
23 | approved by the Agencies in June 1993. A public comment period  
24 | was held from July 14, 1993 to September 20, 1993. In response  
25 | to significant public comment, Respondents installed additional  
26 | groundwater monitoring wells and performed aquifer tests and the  
27 | Agencies conducted supplemental hydraulic modeling to better

1 define the plume of contaminants migrating north of the American  
2 River.

3 K. On June 30, 1994, EPA issued the Action Memorandum and  
4 Responsiveness Summary for the ARSA. In the Action Memorandum,  
5 EPA adopted Respondents' recommendation in the EE/CA, to install  
6 a groundwater extraction and treatment system in the area north  
7 of the American River. EPA also made significant changes to the  
8 proposed action, including 1) basing the design and construction  
9 of the action upon increased groundwater extraction flow rates  
10 from those proposed, 2) requiring the performance of continued  
11 investigation of the ARSA, 3) providing that a supplemental EE/CA  
12 would be required to evaluate a removal action to be installed in  
13 the area south of the American River, and 4) finding that  
14 supplemental treatment methods would be necessary in the future  
15 to treat 1,4-dioxane in the plume of contaminants. A copy of the  
16 Action Memorandum is appended as Appendix A to this Order, and is  
17 thereby incorporated in and made a part of this Order.

18 L. Sentinel wells were installed in 1994 between the  
19 leading edge of the plume of contaminants and the Fair Oaks  
20 drinking water wells. Until March 1995, contaminants were not  
21 confirmed in these wells. March 1995 sampling of these wells  
22 detected low levels of TCE below the MCL; however, these samples  
23 indicate that the leading edge of the plume of hazardous  
24 substances may be moving towards the Fair Oaks drinking water  
25 wells more quickly than the Agencies had anticipated.

1    III. CONCLUSIONS OF LAW AND DETERMINATIONS

2        A.    The Site is a "facility" as defined in section 101(9)  
3 of CERCLA, 42 U.S.C. § 9601(9).

4        B.    Respondents are "persons" as defined in section 101(21)  
5 of CERCLA, 42 U.S.C. § 9601(21).

6        C.    Respondent(s) are "liable parties" as defined in  
7 section 107(a) of CERCLA, 42 U.S.C. § 9607(a), and are subject to  
8 this Order under section 106(a) of CERCLA, 42 U.S.C. § 9606(a).  
9 Respondent Aerojet-General Corporation is the present owner and  
10 operator of the Site, as defined by Section 101(20) of CERCLA, 42  
11 U.S.C. § 9601(20). Respondent Cordova Chemical Company was an  
12 operator of the Site at the time of disposal of hazardous  
13 substances at the site.

14       D.    The substances listed in paragraph E of Section I among  
15 others are found at the Site and are "hazardous substances" as  
16 defined in section 101(14) of CERCLA, 42 U.S.C. § 9601(14).

17       E.    These hazardous substances are being, and have been  
18 released from the Site into the groundwater beneath the Site and  
19 have migrated in groundwater to the American River North Site.

20       F.    The past and present disposal and migration of  
21 hazardous substances from the Site are a "release" as defined in  
22 section 101(22) of CERCLA, 42 U.S.C. § 9601(22).

23       G.    The potential for future migration of hazardous  
24 substances from the Site poses a threat of a "release" as defined  
25 in section 101(22) of CERCLA, 42 U.S.C. § 9601(22).

26       H.    The release and threat of release of one or more  
27 hazardous substances from the facility may present an imminent  
28

1 and substantial endangerment to the public health or welfare or  
2 the environment. The potential contamination of drinking water  
3 supplies or sensitive ecosystems exists because of the migration  
4 of the plume of contaminants from the Site towards, beneath, and  
5 to the area north of the American River.

6 I. The contamination and endangerment at this Site  
7 constitute an indivisible injury. The actions required by this  
8 Order are necessary to protect the public health, welfare, and  
9 the environment.

10  
11 IV. NOTICE TO THE STATE

12 On April 21, 1995, prior to issuing this Order, EPA notified  
13 the State of California that EPA would be issuing this Order.

14  
15 V. ORDER

16 Based on the foregoing, Respondents are hereby ordered,  
17 jointly and severally, to comply with the following provisions,  
18 including but not limited to all appendices to this Order, all  
19 documents incorporated by reference into this Order, and all  
20 schedules and deadlines in this Order, attached to this Order, or  
21 incorporated by reference into this Order.

22  
23 VI. DEFINITIONS

24 Unless otherwise expressly provided herein, terms used in  
25 this Order which are defined in CERCLA or in regulations  
26 promulgated under CERCLA shall have the meaning assigned to them  
27 in the statute or its implementing regulations. Whenever terms

1 listed below are used in this Order or in the documents attached  
2 to this Order or incorporated by reference into this Order, the  
3 following definitions shall apply:

4 A. "Action Memorandum" shall mean the EPA Action Memorandum  
5 for a removal action relating to the Site, signed on June 30,  
6 1994 by the Hazardous Waste Division Director, EPA Region IX, and  
7 all attachments thereto. A copy of the Action Memorandum is  
8 attached as Appendix A to this Order.

9 B. "American River Removal Action" shall mean the removal  
10 action required by the Action Memorandum, any supplement to the  
11 Action Memorandum, this Order, and any modification to this  
12 Order.

13 C. "American River North Removal Action" shall mean the  
14 removal action required by the Action Memorandum for the area  
15 north of the American River.

16 D. "American River North Site" shall mean the areal extent  
17 of hazardous substance contamination in groundwater in the area  
18 north of the American River, as described in the Action  
19 Memorandum.

20 E. "American River Study Area" or "ARSA" shall mean the  
21 groundwater in the areas north and south of the American River  
22 and the American River in the vicinity of the Site, as described  
23 in the Action Memorandum.

24 F. "CERCLA" shall mean the Comprehensive Environmental  
25 Response, Compensation, and Liability Act of 1980, as amended, 42  
26 U.S.C. §§ 9601 et seq.

27 G. "Construction Complete" or "Construction Completion"

1 shall mean the date determined by EPA, after notice from  
2 Respondents that Respondents have completed the construction of  
3 the Treatment Facility, and inspection by EPA if EPA deems  
4 necessary, that the construction of the Treatment Facility shall  
5 be deemed to be complete.

6 H. "Day" shall mean a calendar day unless expressly stated  
7 to be a working day. "Working day" shall mean a day other than a  
8 Saturday, Sunday, or Federal holiday. In computing any period of  
9 time under this Order, where the last day would fall on a  
10 Saturday, Sunday, or Federal holiday, the period shall run until  
11 the end of the next Working Day.

12 I. "DTSC" shall mean the California Department of Toxic  
13 Substances Control, and all successor agencies or departments of  
14 the California government.

15 J. "Effective Date" shall mean the date provided by  
16 Section XXX of this Order.

17 K. "EPA" shall mean the United States Environmental  
18 Protection Agency, and all successor agencies or departments of  
19 the U.S. government.

20 L. "Full Scale Operation" shall mean the routine operation  
21 of a Treatment Facility which occurs after the conclusion of  
22 startup and testing operations and the completion of any  
23 modifications or adjustments required as a result of the startup  
24 and testing operations during a period of development. EPA shall  
25 determine the date a Treatment Facility is deemed to be in Full  
26 Scale Operation.

27 M. "National Contingency Plan" or "NCP" shall mean the  
28

1 National Contingency Plan promulgated pursuant to Section 105 of  
2 CERCLA, 42 U.S.C. § 9605, codified at 40 C.F.R. Part 300,  
3 including any amendments thereto.

4 N. "Operation and Maintenance" or "O&M" shall mean all  
5 activities required under the Operation and Maintenance Plan  
6 developed by Respondents pursuant to this Order, and approved by  
7 EPA.

8 O. "Notice of Completion" shall mean notice by EPA that the  
9 Work required by this Order is complete.

10 P. "Paragraph" shall mean a portion of this Order  
11 identified by an upper case letter.

12 Q. "Performance Standards" shall mean those cleanup  
13 standards, standards of control, and other substantive  
14 requirements, criteria or limitations, identified in the Action  
15 Memorandum, in any supplement to the Action Memorandum, or  
16 otherwise established in this Order, that the Work required by  
17 this Order must attain and maintain.

18 R. "Removal Action" shall mean those activities, except for  
19 Operation and Maintenance, to be undertaken by Respondents to  
20 implement the final plans and specifications submitted by  
21 Respondents pursuant to the Final Removal Action Work Plan,  
22 including any additional activities required under this Order.

23 S. "Removal Design" shall mean those activities to be  
24 undertaken by Respondents to develop the final plans and  
25 specifications for the Removal Action pursuant to the Final  
26 Removal Action Work Plan.

27 T. "Respondents" shall mean Aerojet-General Corporation and  
28

1 Cordova Chemical Company.

2 U. "Response Costs" shall mean all costs, including direct  
3 costs, indirect costs, and accrued interest incurred by the  
4 United States and the State to perform or support response  
5 actions at the Site. Response costs include but are not limited  
6 to the costs of overseeing the Work, such as the costs of  
7 reviewing or developing plans, reports and other items pursuant  
8 to this Order and costs associated with verifying the Work.

9 V. "RWQCB" shall mean the California Regional Water Quality  
10 Control Board, Central Valley Region, and all successor agencies  
11 and departments of the California government.

12 W. "Section" shall mean a portion of this Order identified  
13 by a roman numeral.

14 X. "Site" shall mean the Aerojet Superfund site,  
15 encompassing approximately 8,500 acres, located approximately 15  
16 miles east of downtown Sacramento, California, as described at  
17 Section I, Paragraph A above.

18 Y. "State" shall mean the State of California.

19 Z. "Treatment Facility" shall mean a groundwater extraction  
20 and treatment facility constructed pursuant to the Action  
21 Memorandum or any supplement to the Action Memorandum.

22 AA. "United States" or "U.S." shall mean the United States  
23 of America.

24 AB. "Work" shall mean all activities Respondents are  
25 required to perform under this Order, including without  
26 limitation the design, construction, operation and maintenance of  
27 the Treatment Facility for the American River North Removal



1 Action, and any activities required to be undertaken pursuant to  
2 Sections VII through XXV of this Order.

3 VII. NOTICE OF INTENT TO COMPLY

4 Respondents shall provide, not later than ten (10) days  
5 after the Effective Date of this Order, written notice to EPA's  
6 Remedial Project Manager (RPM) stating whether they will comply  
7 with the terms of this Order. If Respondents do not  
8 unequivocally commit to perform the Removal Action activities as  
9 provided by this Order, they shall be deemed to have violated  
10 this Order and to have failed or refused to comply with this  
11 Order. Respondents' written notice shall describe, using facts  
12 that exist on or prior to the effective date of this Order, any  
13 "sufficient cause" defenses asserted by Respondents under  
14 sections 106(b) and 107(c)(3) of CERCLA. The absence of a  
15 response by EPA to the notice required by this Section shall not  
16 be deemed to be acceptance of Respondents' assertions.

17 VIII. PARTIES BOUND

18 A. This Order shall apply to and be binding upon each of  
19 the Respondents identified in Section VI, Paragraph T, their  
20 directors, officers, employees, agents, successors, and assigns.  
21 Respondents are jointly and severally responsible for carrying  
22 out all activities required by this Order. No change in the  
23 ownership, corporate status, or other control of any Respondents  
24 shall alter any of the Respondents' responsibilities under this  
25 Order.

26 B. Respondents shall provide a copy of this Order to any  
27 prospective owners or successors before a controlling interest in

1 a Respondent's assets, property rights, or stock are transferred  
2 to the prospective owner or successor. Respondents shall provide  
3 a copy of this Order to each contractor, sub-contractor,  
4 laboratory, or consultant retained to perform any Work under this  
5 Order, within ten days after the Effective Date of this Order or  
6 on the date such services are retained, whichever date occurs  
7 later. Respondents shall also provide a copy of this Order to  
8 each person representing any Respondents with respect to the Work  
9 and shall condition all contracts and subcontracts entered into  
10 hereunder upon performance of the Work in conformity with the  
11 terms of this Order. With regard to the activities undertaken  
12 pursuant to this Order, each contractor and subcontractor shall  
13 be deemed to be related by contract to the Respondents within the  
14 meaning of section 107(b)(3) of CERCLA, 42 U.S.C. § 9607(b)(3).  
15 Notwithstanding the terms of any contract, Respondents are  
16 responsible for compliance with this Order and for ensuring that  
17 their contractors, subcontractors and agents comply with this  
18 Order, and perform any Work in accordance with this Order.

19 C. Within ten (10) days after the Effective Date of this  
20 Order, each Respondent that owns real property comprising all or  
21 part of the American River North Site shall record a copy or  
22 copies of this Order in the appropriate governmental office where  
23 land ownership and transfer records are filed or recorded, and  
24 shall ensure that the recording of this Order is indexed to the  
25 titles of each and every property at the American River North  
26 Site so as to provide notice to third parties of the issuance and  
27 terms of this Order with respect to those properties.

1 Respondents shall, within fifteen (15) days after the Effective  
2 Date of this Order, send notice of such recording and indexing to  
3 EPA.

4 D. Not later than sixty (60) days prior to any transfer of  
5 any real property interest in any property included within the  
6 American River North Site, Respondents shall submit a true and  
7 correct copy of the transfer documents to EPA, and shall identify  
8 the transferee by name, principal business address and effective  
9 date of the transfer.

10  
11 IX. WORK TO BE PERFORMED

12 A. Respondents shall perform, at a minimum, the following  
13 response activities:

14 1. Design, construct, operate and maintain the  
15 Treatment Facility required by the Action Memorandum for the  
16 American River North Site, to contain the plume of hazardous  
17 substances in groundwater in the area north of the American River  
18 and treat the groundwater in that area.

19 2. Implement a monitoring program for aquifer control  
20 and water treatment systems in accordance with Appendix B to this  
21 Order.

22 3. Perform quarterly groundwater sampling in  
23 accordance with Appendix B to this Order.

24 4. Perform monitoring of the Chicago and Town Wells  
25 (State Well Nos. 9N/7E-F1 and 9N/6E-12-Q1, respectively) of the  
26 Fair Oaks drinking water wells, in accordance with Appendix B.

5. Implement and maintain all Performance Standards contained in the Action Memorandum, this Order, or which may be established pursuant to this Order.

B. Respondents shall cooperate with EPA in providing information regarding the Work to the public. As requested by EPA, Respondents shall participate in the preparation of such information for distribution to the public and in public meetings which may be held or sponsored by EPA to explain activities at or relating to the Site.

C. All aspects of the Work to be performed by Respondents pursuant to this Order shall be under the direction and supervision of a qualified project manager the selection of which shall be subject to approval by EPA. Within 10 (ten) days after the Effective Date of this Order, Respondents shall notify EPA in writing of the name and qualifications of the project manager, including primary support entities and staff, proposed to be used in carrying out Work under this Order. If at any time Respondents propose to use a different project manager, Respondents shall notify EPA and shall obtain approval from EPA before the new project manager performs any Work under this Order.

D. EPA will review Respondents' selection of a project manager according to the terms of this paragraph and Section XV of this Order. If EPA disapproves of the selection of the project manager, Respondents shall submit to EPA within thirty (30) days after receipt of EPA's disapproval of the project manager previously selected, a list of project managers,

1 including primary support entities and staff, that would be  
2 acceptable to Respondents. EPA will thereafter provide written  
3 notice to Respondents of the names of the project managers that  
4 are acceptable to EPA. Respondents may then select any approved  
5 project manager from that list and shall notify EPA of the name  
6 of the project manager selected within ten (10) days of EPA's  
7 designation of approved project managers.

8 E. Removal Action Work Plan. On or about March 6, 1995,  
9 Respondents submitted to EPA for approval a draft Removal Action  
10 Work Plan and 60% Basis of Design Report dated March 6, 1995.

11 The draft Removal Action Work Plan and Basis of Design  
12 Report was required to include, but was not limited to, the  
13 following information:

14 1. a description of the American River Removal Action  
15 consistent with the Action Memorandum and any supplement to the  
16 Action Memorandum;

17 2. a description of initial site conditions for the  
18 American River North Removal Action, including without limitation  
19 the availability of utilities, restrictions on road use,  
20 availability of access to the site(s) selected for the American  
21 River North Treatment Facility, the status of any necessary  
22 permits or applications for such permits, and any other site  
23 conditions or characteristics which may inhibit or otherwise  
24 significantly affect expeditious implementation of the American  
25 River North Removal Action;

26 3. a description of the technology and design approach  
27 selected for the American River North Removal Action, including  
28

1 without limitation design criteria for the American River North  
2 Treatment Facility, and a summary of all available technical  
3 information (including without limitation a listing of the source  
4 and description of all data);

5 4. a description of Performance Standards for the  
6 American River North Removal Action, including without limitation  
7 a description of all Applicable or Relevant and Appropriate  
8 Requirements ("ARARS") and the procedures for attainment of such  
9 ARARS;

10 5. a description of health and safety criteria  
11 applicable to the American River North Removal Action;

12 6. a description of all documents and information  
13 required under this Order to be submitted to EPA in the course of  
14 the American River North Removal Action ("the Deliverables"),  
15 including without limitation design documents, monitoring plans,  
16 progress reports, health and safety plans or modifications,  
17 quality assurance plans or modifications, and the deliverables  
18 described in subparagraph F. below;

19 7. a description of an Effectiveness Program  
20 consistent with the requirements described in Exhibit II, Section  
21 I, Paragraph B, and Exhibit II, Table 1 of the Partial Consent  
22 Decree or as otherwise established by EPA; and

23 8. a schedule for the implementation of the American  
24 River North Treatment Facility that shall be based on the dates  
25 for submission of the Deliverables described in Paragraph F of  
26 this Section, and include projected dates for the construction to  
27 commence, the Construction Completion Date, and the date the

1 American River North Treatment Facility will reach Full Scale  
2 Operation.

3 9. an American River North Basis of Design (60%)  
4 Report, including without limitation the project description,  
5 design requirements and provisions, operation and maintenance  
6 provisions, design assumptions, permits plan, easement/access  
7 requirements, a removal action schedule, a removal action cost  
8 estimate, an operation and maintenance requirements cost  
9 estimate, and any pertinent data used to develop the design. On  
10 or about January 20, 1995, Respondents submitted the American  
11 River North Basis of Design (60%) Report dated January 20, 1995.

12 F. Deliverables. The Deliverables specified in the draft  
13 Removal Action Work Plan are required to include:

14 1. an American River South Removal Action Assessment  
15 Report. The American River South Removal Action Assessment  
16 Report shall be submitted no later than forty-five (45) calendar  
17 days after the Effective Date of this Order. The American River  
18 South Removal Action Assessment Report shall include, without  
19 limitation, a description of the status of Respondents'  
20 additional investigation of the area south of the American River,  
21 including without limitation the status of any supplement to the  
22 EE/CA being prepared by Respondents for the area south of the  
23 American River, any pertinent hydraulic, geologic or chemical  
24 data collected for the American River South, and a schedule for  
25 completion of a supplement to the EE/CA for the American River  
26 South;

27 2. an American River South Supplement to the EE/CA.

1 The American River South Supplement to the EE/CA shall be  
2 submitted in accordance with the schedule in the American River  
3 South Removal Action Assessment Report, subject to approval of  
4 such schedule by EPA. The American River South Supplement to the  
5 EE/CA shall include the documentation used to make the removal  
6 action decision including site characterization, removal action  
7 objectives, and an evaluation of the removal action alternatives.  
8 The evaluation shall consider technical feasibility, costs,  
9 environmental impacts and institutional considerations.

10 3. a Pre-final/Final (90%/100%) American River North  
11 Design Report. The Pre-final/Final (90%/100%) American River  
12 North Design Report shall be submitted sixty (60) calendar days  
13 after the approval or conditional approval of the draft Removal  
14 Action Work Plan, and shall set forth, without limitation, the  
15 design assumptions, permits plan, easement/access requirements,  
16 complete specifications, drawings and schematics, removal action  
17 cost estimate, removal action schedule, construction quality  
18 assurance plan, conceptual operation and maintenance plan,  
19 conceptual monitoring plan, and any pertinent data used to  
20 develop the design.

21 4. a Final Removal Action American River North Work  
22 Plan. The Final Removal Action American River North Work Plan  
23 shall be the final version of the draft Removal Action Work Plan  
24 and the American River North Pre-final/Final (90%/100%) Design  
25 Report after their approval by EPA, with any required revisions  
26 or modifications required by EPA. If revisions of the draft  
27 Removal Action Work Plan or American River North Pre-final/Final



1 (90%/100%) Design Report are required for approval of the Final  
2 American River North Removal Action Work Plan, then Respondents  
3 shall submit a Final American River North Removal Action Work  
4 Plan incorporating such modifications within fourteen (14)  
5 calendar days receipt of EPA' written comments on the Pre-  
6 Final/Final (90%/100%) Design Report.

7 5. an American River North Monitoring Plan. The  
8 American River North Monitoring Plan shall be submitted thirty  
9 (30) calendar days after the approval or conditional approval of  
10 the Final American River North Removal Action Work Plan by the  
11 EPA. The Monitoring Plan shall include a description of the  
12 routine monitoring and laboratory testing, including Quality  
13 Assurance/Quality Control ("QA/QC") and frequency during facility  
14 shakedown and full scale operation.

15 6. an American River North Health & Safety Plan. The  
16 Health & Safety Plan shall provide for all appropriate measures  
17 to ensure the protection of the public health and safety during  
18 performance of the Work. This plan shall be prepared in  
19 accordance with EPA's Standard Operation Safety Guide, November  
20 1994 and July 1988, and with applicable Occupational Safety and  
21 Health Administration (OSHA) regulations found at 29 C.F.R. Part  
22 1910.

23 7. an American River North Operation & Maintenance  
24 ("O&M") Plan. The O&M Plan shall be submitted thirty (30)  
25 calendar days after the approval or conditional approval of the  
26 Final American River North Removal Action Work Plan by the EPA.  
27 The O&M Plan shall include a description of normal operations and  
28

1 maintenance, potential operating problems, alternate O&M plans,  
2 safety plans, descriptions of equipment, costs, and  
3 records/reporting mechanisms.

4           8. an American River North Removal Action Report. EPA  
5 shall perform an inspection of the completed construction for the  
6 American River North Treatment Facility, and shall determine  
7 Construction Completion. The Removal Action Report shall be  
8 submitted within sixty (60) calendar days after the final  
9 inspection of the completed construction for such facilities, and  
10 shall summarize the design and construction activities, including  
11 without limitation a chronology of events, performance standards  
12 attained or not attained, a description of quality assurance/  
13 quality control procedures followed, a description of the  
14 construction activities, documentation of the final inspection,  
15 certification that the removal action is operational, a  
16 discussion of O&M documentation, and a summary of project costs.

17           9. an American River North Interim Removal Action  
18 Effectiveness Report. The Interim Removal Action Effectiveness  
19 Report shall be submitted nine (9) months after Construction  
20 Completion and shall include a summary and evaluation of  
21 hydraulic, geologic and chemical information, based upon at least  
22 six (6) months of operational data to be included with the  
23 report.

24           10. an American River North Removal Action  
25 Effectiveness Report. The Removal Action Effectiveness Report  
26 will be conducted in two parts at a minimum.

27           a. The Part 1 Removal Action Effectiveness  
28

1 Report. The Part 1 Removal Action Effectiveness Report shall be  
2 submitted within eighteen (18) months of commencement of Full  
3 Scale Operation and shall be based upon a minimum of twelve (12)  
4 months of data collected after facility shakedown. The Part 1  
5 Removal Action Effectiveness Report shall update and supplement,  
6 as appropriate, the information submitted in the Removal Action  
7 Report. The Part 1 Removal Action Effectiveness Report shall  
8 also contain a description of any unexpected or unanticipated  
9 conditions encountered in the operation of the project, including  
10 without limitation any discrepancies in the project  
11 implementation from the description given in the Removal Action  
12 Work Plan. In addition, the Part 1 Removal Action Effectiveness  
13 Report shall provide an assessment of the effectiveness of the  
14 groundwater treatment system in removing chemicals from  
15 groundwater, an evaluation of both the hydraulic zone of capture  
16 and the effectiveness of that zone of capture in intercepting the  
17 migration of chemicals, an interpretation of the ARSA  
18 hydrogeology, an evaluation of long-term chemical movement in  
19 groundwater, and an assessment of the potential for impact to  
20 water supplies. Respondents shall provide geologic cross-  
21 sections, an evaluation of vertical and horizontal gradients, and  
22 illustrations showing the concentrations of chemicals in the  
23 groundwater to support its interpretation of ARSA hydrogeology.  
24 Respondents may use a groundwater model to support conclusions in  
25 the Part 1 Removal Action Effectiveness Report.

26                   b. Part 2 Removal Action Work Plan and Field  
27 Work. The Part 1 Removal Action Effectiveness Report shall also

1 contain a Part 2 Removal Action Work Plan to collect the  
2 information identified in Part 1 through field activities and  
3 associated analyses to continue evaluation of the effectiveness  
4 of this removal action. The Part 2 Work Plan shall be submitted  
5 for approval by EPA and contain a schedule for conducting the  
6 proposed work.

7 Respondents shall conduct the Part 2 Removal Action  
8 Effectiveness field work and analysis in accordance with the  
9 approved Part 2 Work Plan.

10 c. The American River North Part 2 Removal Action  
11 Effectiveness Report. Respondents shall prepare a report on the  
12 results of the Part 2 Effectiveness field work in accordance with  
13 the schedule set forth in the approved Part 2 Work Plan. The  
14 Part 2 Effectiveness Report will evaluate the effectiveness in  
15 intercepting the migration of chemicals in groundwater and the  
16 effectiveness of the groundwater treatment plant. Based on this  
17 new information, the Part 2 Removal Action Effectiveness Report  
18 shall include an assessment of the effectiveness of the  
19 groundwater treatment system in removing chemicals from  
20 groundwater, an evaluation of both the hydraulic zone of capture  
21 and the effectiveness of that zone of capture in intercepting the  
22 migration of chemicals, an interpretation of the ARSA  
23 hydrogeology, an evaluation of long-term chemical movement in  
24 groundwater, and an assessment of the potential for impact to  
25 water supplies. Respondents shall provide geologic cross-  
26 sections, an evaluation of vertical and horizontal gradients, and  
27 illustrations showing the concentrations of chemicals in the

1 groundwater to support its interpretation of ARSA hydrogeology.  
2 Respondents may use a groundwater model to support the  
3 conclusions in the Part 2 Removal Action Effectiveness Report.  
4 The Part 2 Removal Action Effectiveness Report shall include a  
5 description of the combined effectiveness of the American River  
6 North Treatment Facility with any Treatment Facility which may  
7 have been constructed for the American River South. Respondents  
8 shall also make recommendations, as appropriate, for any changes  
9 in the design or operation of the American River North Treatment  
10 Facility or additions to the monitor well network.

11 G. The Work, and all deliverables shall comply with  
12 "Superfund Remedial Design and Remedial Action Guidance," OSWER  
13 Directive 9355.0-4A, "Guidance for Scoping the Remedial Design,"  
14 OSWER Directive 9355.0-43, May 1993, the Remedial Design and  
15 Remedial Action Handbook, August 1993, and any revisions to these  
16 guidances; and with any other applicable guidance issued by EPA.  
17 Upon approval by EPA, the deliverables prepared pursuant to this  
18 Order, as approved by EPA, including approved schedules, are  
19 incorporated into this Order as requirements of this Order and  
20 shall be enforceable parts of this Order.

21 X. SELECTION OF CONTRACTORS

22 Respondents shall retain a contractor qualified to undertake  
23 and complete the requirements of this Order, and shall notify EPA  
24 of the name of such contractor within 14 (fourteen) days of the  
25 Effective Date of this Order. EPA retains the right to  
26 disapprove of any, or all, of the contractors and/or  
27 subcontractors retained by Respondents. In the event EPA  
28

disapproves of a selected contractor, Respondents shall retain a different contractor to perform the work, and such selection shall be made within two (2) business days following EPA's disapproval.

#### XI. PERFORMANCE STANDARDS

The Work performed by Respondents pursuant to this Order shall, at a minimum, achieve the Performance Standards specified in the Action Memorandum. It shall also meet the Discharge Limitations and any other Performance Standards specified in Appendix B to this Order.

Notwithstanding any action by EPA, Respondents remain fully responsible for achievement of the Performance Standards in the Action Memorandum and this Order. Nothing in this Order, or in EPA's approval of any submission, shall be deemed to constitute a warranty or representation of any kind by EPA that full performance of the Removal Action will achieve the Performance Standards set forth in the Action Memorandum or this Order. Respondents' compliance with such approved documents does not foreclose EPA from seeking additional work to achieve the applicable performance standards.

#### XII. FAILURE TO ATTAIN PERFORMANCE STANDARDS

A. In the event that EPA determines that additional response activities are necessary to meet applicable Performance Standards, EPA may notify Respondents that additional response actions are necessary.

B. Unless otherwise stated by EPA, within thirty (30) days of receipt of notice from EPA that additional response activities

1 are necessary to meet any applicable Performance Standards,  
2 Respondents shall submit for approval by EPA a work plan for the  
3 additional response activities. The plan shall conform to the  
4 applicable requirements of section IX of this Order. Upon EPA's  
5 approval of the plan pursuant to Section XV of this Order,  
6 Respondents shall implement the plan for additional response  
7 activities in accordance with the provisions and schedule  
8 contained therein.

9 XIII. ADDITIONAL RESPONSE ACTIONS

10 A. EPA may determine that in addition to the Work  
11 identified in this Order and attachments to this Order,  
12 additional response activities may be necessary to protect human  
13 health and the environment. If EPA determines that additional  
14 response activities are necessary, EPA may require Respondents to  
15 submit a work plan for additional response activities. EPA may  
16 also require Respondents to modify any plan, design, or other  
17 deliverable required by this Order, including any approved  
18 modifications.

19 B. Not later than thirty (30) days after receiving EPA's  
20 notice that additional response activities are required pursuant  
21 to this Section, Respondents shall submit a work plan for the  
22 response activities to EPA for review and approval. Upon  
23 approval by EPA, the work plan is incorporated into this Order as  
24 a requirement of this Order and shall be an enforceable part of  
25 this Order. Upon approval of the work plan by EPA, Respondents  
26 shall implement the work plan according to the standards,  
27 specifications, and schedule in the approved work plan.

1 Respondents shall notify EPA of their intent to perform such  
2 additional response activities within seven (7) days after  
3 receipt of EPA's request for additional response activities.

4 XIV. ENDANGERMENT AND EMERGENCY RESPONSE

5 A. In the event of any action or occurrence during the  
6 performance of the Work which causes or threatens to cause a  
7 release of a hazardous substance or which may present an  
8 immediate threat to public health or welfare or the environment,  
9 Respondents shall immediately take all appropriate action to  
10 prevent, abate, or minimize the threat, and shall immediately  
11 notify EPA's Remedial Project Manager (RPM) or, if the RPM is  
12 unavailable, the Section Chief of the RPM. If neither of these  
13 persons is available Respondents shall notify the EPA Emergency  
14 Response Unit, Region IX. Respondents shall take such action in  
15 consultation with EPA's RPM and in accordance with all applicable  
16 provisions of this Order, including but not limited to the Health  
17 and Safety Plan.

18 B. Nothing in the preceding paragraph shall be deemed to  
19 limit any authority of the United States to take, direct, or  
20 order all appropriate action to protect human health and the  
21 environment or to prevent, abate, or minimize an actual or  
22 threatened release of hazardous substances on, at, or from the  
23 Site.

24 XV. EPA REVIEW OF SUBMISSIONS

25 A. After review of any deliverable, plan, report or other  
26 item which is required to be submitted for review and approval  
27 pursuant to this Order, EPA may: (1) approve the submission; (2)



1 approve the submission with modifications; (3) disapprove the  
2 submission and direct Respondents to re-submit the document after  
3 incorporating EPA's comments; or (4) disapprove the submission  
4 and assume responsibility for performing all or any part of the  
5 response action. As used in this Order, the terms "approval by  
6 EPA," "EPA approval," or a similar term means the action  
7 described in (1) or (2) of this paragraph.

8 B. In the event of approval or approval with modifications  
9 by EPA, Respondents shall proceed to take any action required by  
10 the plan, report, or other item, as approved or modified by EPA.

11 C. Upon receipt of a notice of disapproval or a request for  
12 a modification, Respondents shall, within twenty-one (21) days or  
13 such longer time as specified by EPA in its notice of disapproval  
14 or request for modification, correct the deficiencies and  
15 resubmit the plan, report, or other item for approval.

16 Notwithstanding the notice of disapproval, or approval with  
17 modifications, Respondents shall proceed, at the direction of  
18 EPA, to take any action required by any non-deficient portion of  
19 the submission.

20 D. If any submission is not approved by EPA, Respondents  
21 shall be deemed to be in violation of this Order.

## 22 23 XVI. PROGRESS REPORTS

24 In addition to the other deliverables set forth in this  
25 Order, Respondents shall provide quarterly progress reports to  
26 EPA with respect to actions and activities undertaken pursuant to  
27 this Order. The progress reports shall be submitted on or before  
28

1 the 20th day of each quarter following the effective date of this  
2 Order. Respondents' obligation to submit progress reports  
3 continues until EPA gives Respondents written notice that they  
4 may cease submitting progress reports. At a minimum these  
5 progress reports shall: (1) describe the actions which have been  
6 taken to comply with this Order during the prior quarter; (2)  
7 include all results of sampling and tests and all other data  
8 received by Respondents and not previously submitted to EPA; (3)  
9 describe all work planned for the next quarter with schedules  
10 relating such work to the overall project schedule for Removal  
11 Action completion; and (4) describe all problems encountered and  
12 any anticipated problems, any actual or anticipated delays, and  
13 solutions developed and implemented to address any actual or  
14 anticipated problems or delays.

15  
16 XVII. QUALITY ASSURANCE, SAMPLING AND DATA ANALYSIS

17 Respondents shall use the quality assurance, quality  
18 control, and chain of custody procedures described in the "EPA  
19 NEIC Policies and Procedures Manual," May 1978, revised May 1986,  
20 EPA-330/9-78-001-R, EPA's "Guidelines and Specifications for  
21 Preparing Quality Assurance Program Documentation," June 1, 1987,  
22 EPA's "Data Quality Objective Guidance," (EPA/540/G87/003 and  
23 004), and any amendments to these documents, while conducting all  
24 sample collection and analysis activities required herein by any  
25 plan. To provide quality assurance and maintain quality control,  
26 Respondents shall:

27 A. Use only laboratories which have a documented Quality  
28

1 Assurance Program that complies with EPA guidance  
2 document QAMS-005/80.

3 B. Ensure that the laboratory used by the Respondents for  
4 analyses, performs according to a method or methods  
5 deemed satisfactory to EPA and submits all protocols to  
6 be used for analyses to EPA at least 10 days before  
7 beginning analysis.

8 C. Ensure that EPA personnel and EPA's authorized  
9 representatives are allowed access to the laboratory  
10 and personnel utilized by the Respondents for analyses.

11 Respondents shall notify EPA not less than fourteen (14)  
12 days in advance of any sample collection activity. At the  
13 request of EPA, Respondents shall allow split or duplicate  
14 samples to be taken by EPA, the State or their authorized  
15 representatives, of any samples collected by Respondents with  
16 regard to the Site or pursuant to the implementation of this  
17 Order. In addition, EPA shall have the right to take any  
18 additional samples that EPA deems necessary.

19 XVIII. COMPLIANCE WITH APPLICABLE LAWS

20 A. All activities by Respondents pursuant to this Order  
21 shall be performed in accordance with the requirements of all  
22 Federal and State laws and regulations. EPA has determined that  
23 the activities contemplated by this Order are consistent with the  
24 National Contingency Plan (NCP).

25 B. To the extent provided in section 121(e) of CERCLA and  
26 the NCP, no permit shall be required for any portion of the Work  
27 conducted entirely on-site at the American River North Site.  
28 Where any portion of the Work requires a Federal or State permit  
or approval, Respondents shall submit timely applications and  
take all other actions necessary to obtain and to comply with all

1 such permits or approvals.

2 C. This Order is not, and shall not be construed to be, a  
3 permit issued pursuant to any Federal or State statute or  
4 regulation.

5 D. All materials removed from the American River North  
6 Site shall be disposed of or treated at a facility approved by  
7 EPA's RPM and in accordance with section 121(d)(3) of CERCLA, 42  
8 U.S.C. § 9621(d)(3); with the U.S. EPA "Procedures for Planning  
9 and Implementing Off-site Response Actions," October 22, 1993,  
10 codified at 40 C.F.R. § 300.440 (see 58 Fed. Reg. 49200,  
11 September 22, 1993); and with all other applicable Federal,  
12 State, and local requirements.

13 XIX. OFF-SITE SHIPMENT OF HAZARDOUS SUBSTANCES

14 A. Respondents shall, prior to any off-site shipment of  
15 hazardous substances from the American River North Site to an  
16 out-of-state waste management facility, provide written  
17 notification to the appropriate state environmental official in  
18 the receiving state and to EPA's RPM of such shipment of  
19 hazardous substances. However, the notification of shipments  
20 shall not apply to any off-site shipments when the total volume  
21 of all shipments from the American River North Site to the State  
22 will not exceed ten (10) cubic yards.

23 B. The notification shall be in writing, and shall include  
24 the following information, where available: (1) the name and  
25 location of the facility to which the hazardous substances are to  
26 be shipped; (2) the type and quantity of the hazardous substances  
27 to be shipped; (3) the expected schedule for the shipment of the

1 hazardous substances; and (4) the method of transportation.  
2 Respondents shall notify the receiving state of major changes in  
3 the shipment plan, such as a decision to ship the hazardous  
4 substances to another facility within the same state, or to a  
5 facility in another state.

6 C. The identity of the receiving facility and state will  
7 be determined by Respondents following the award of the contract  
8 for Removal Action construction. Respondents shall provide all  
9 relevant information, including information under the categories  
10 noted in Paragraph B above, on the off-site shipments from the  
11 American River North Site as soon as practicable after the award  
12 of the contract and before the hazardous substances are actually  
13 shipped.

14 XX. REMEDIAL PROJECT MANAGER

15 A. All communications, whether written or oral, including  
16 but not limited to deliverables, from Respondents to EPA shall be  
17 directed to EPA's Remedial Project Manager. Copies shall also be  
18 provided to the designated DTSC and RWQCB Staff assigned to this  
19 matter. Respondents shall submit to EPA three copies of all  
20 documents, including plans, reports, and other correspondence,  
21 which are developed pursuant to this Order, and shall send these  
22 documents by U.S. Mail or express delivery.

23  
24 EPA's Remedial Project Manager is:

25 Joann Cola, H-7-1  
26 U.S. EPA, Region IX  
27 75 Hawthorne Street  
28

1 San Francisco, CA 94105

2  
3 The State Representatives are:

4 Duncan Austin

5 Department of Toxic Substances Control

6 10151 Croydon Way

7 Sacramento, CA 95827

8  
9 Alexander MacDonald

10 Regional Water Quality Control Board

11 3443 Routier Road

12 Sacramento, CA 95827

13  
14 B. EPA and the State Agencies have the unreviewable right  
15 to change their Remedial Project Manager or State counterpart.  
16 If EPA changes its Remedial Project Manager, or the State changes  
17 its designated staff person(s), EPA or the State as applicable  
18 will inform Respondents in writing of the name, address, and  
19 telephone number of the new Remedial Project Manager or State  
20 designee(s).

21 C. EPA's RPM shall have the authority lawfully vested in a  
22 Remedial Project Manager (RPM) and On-Scene Coordinator (OSC) by  
23 the National Contingency Plan, 40 C.F.R. Part 300. EPA's RPM  
24 shall have authority, consistent with the National Contingency  
25 Plan, to halt any work required by this Order, and to take any  
26 necessary response action.

1 XXI. ACCESS TO SITE NOT OWNED BY RESPONDENTS

2       A.    If the American River North Site, any area that is to  
3 be used for access, property where documents required to be  
4 prepared or maintained by this Order are located, or other  
5 property subject to or affected by the clean up, is owned in  
6 whole or in part by parties other than those bound by this Order,  
7 Respondents will obtain, or use their best efforts to obtain,  
8 site access agreements from the present owners within thirty (30)  
9 days of the Effective Date of this Order. Such agreements shall  
10 provide access for EPA, its contractors and oversight officials,  
11 the State and its contractors, and Respondents or Respondents'  
12 authorized representatives and contractors, and such agreements  
13 shall specify that Respondents are not EPA's representative with  
14 respect to liability associated with American River North Site  
15 activities. Respondents shall save and hold harmless the United  
16 States and its officials, agents, employees, contractors,  
17 subcontractors, or representatives for or from any and all claims  
18 or causes of action or other costs incurred by the United States  
19 including but not limited to attorneys fees and other expenses of  
20 litigation and settlement arising from or on account of acts or  
21 omissions of Respondents, their officers, directors, employees,  
22 agents, contractors, subcontractors, and any persons acting on  
23 their behalf or under their control, in carrying out activities  
24 pursuant to this Order, including any claims arising from any  
25 designation of Respondents as EPA's authorized representatives  
26 under section 104(e) of CERCLA. Copies of such agreements shall  
27 be provided to EPA prior to Respondents' initiation of field

1 activities. Respondents' best efforts shall include providing  
2 reasonable compensation to a property owner. If access  
3 agreements are not obtained within the time referenced above,  
4 Respondents shall immediately notify EPA of their failure to  
5 obtain access. Subject to the United States' non-reviewable  
6 discretion, EPA may use its legal authorities to obtain access  
7 for the Respondents, may perform those response actions with EPA  
8 contractors at the property in question, or may terminate the  
9 Order if Respondents cannot obtain access agreements. If EPA  
10 performs those tasks or activities with contractors and does not  
11 terminate the Order, Respondents shall perform all other  
12 activities not requiring access to that property. Respondents  
13 shall integrate the results of any such tasks undertaken by EPA  
14 into their reports and deliverables.

15 XXII. SITE ACCESS AND DATA/DOCUMENT AVAILABILITY

16 Respondents shall allow EPA and its authorized  
17 representatives and contractors to enter and freely move about  
18 all property at the American River North Site and off-site areas  
19 subject to or affected by the Work under this Order or where  
20 documents required to be prepared or maintained by this Order are  
21 located, for the purposes of inspecting conditions, activities,  
22 the results of activities, records, operating logs, and contracts  
23 related to the American River North Site or Respondents and their  
24 representatives or contractors pursuant to this Order; reviewing  
25 the progress of the Respondents in carrying out the terms of this  
26 Order; conducting tests as EPA or its authorized representatives  
27 or contractors deem necessary; using a camera, sound recording



1 device or other documentary type equipment; and verifying the  
2 data submitted to EPA by Respondents. Respondents shall allow  
3 EPA and its authorized representatives to enter the Site or the  
4 American River North Site, to inspect and copy all records,  
5 files, photographs, documents, sampling and monitoring data, and  
6 other writings related to work undertaken in carrying out this  
7 Order. Nothing herein shall be interpreted as limiting or  
8 affecting EPA's right of entry or inspection authority under  
9 Federal law.

10 XXIII. RECORD PRESERVATION

11 A. Respondents shall provide to EPA upon request copies of  
12 all documents and information within their possession and/or  
13 control or that of their contractors or agents relating to  
14 activities at the American River North Site or to the  
15 implementation of this Order, including but not limited to  
16 sampling, analysis, chain of custody records, manifests, trucking  
17 logs, receipts, reports, sample traffic routing, correspondence,  
18 or other documents or information related to the Work.  
19 Respondents shall also make available to EPA for purposes of  
20 investigation, information gathering, or testimony, their  
21 employees, agents, or representatives with knowledge of relevant  
22 facts concerning the performance of the Work.

23 B. Until ten (10) years after EPA provides Notice of  
24 Completion, each Respondent shall preserve and retain all records  
25 and documents in its possession or control, including the  
26 documents in the possession or control of their contractors and  
27 agents on and after the Effective Date of this Order that relate  
28

1 in any manner to the Work. At the conclusion of this document  
2 retention period, Respondents shall notify the United States at  
3 least ninety (90) calendar days prior to the destruction of any  
4 such records or documents, and upon request by the United States,  
5 Respondents shall deliver any such records or documents to EPA.

6 C. Until ten (10) years after EPA provides Notice of  
7 Completion, Respondents shall preserve, and shall instruct their  
8 contractors and agents to preserve, all documents, records, and  
9 information of whatever kind, nature or description relating to  
10 the performance of the Work. Upon the conclusion of this  
11 document retention period, Respondents shall notify the United  
12 States at least ninety (90) days prior to the destruction of any  
13 such records, documents or information, and, upon request of the  
14 United States, Respondents shall deliver all such documents,  
15 records and information to EPA.

16 XXIV. DELAY IN PERFORMANCE

17 A. Any delay in performance of this Order that, in EPA's  
18 judgment, is not properly justified by Respondents under the  
19 terms of this Paragraph shall be considered a violation of this  
20 Order. Any delay in performance of this Order shall not affect  
21 Respondents' obligations to fully perform all obligations under  
22 the terms and conditions of this Order.

23 B. Respondents shall notify EPA of any delay or  
24 anticipated delay in performing any requirement of this Order.  
25 Such notification shall be made by telephone to EPA's RPM within  
26 forty eight (48) hours after Respondents first knew or should  
27 have known that a delay might occur. Respondents shall adopt all

1 reasonable measures to avoid or minimize any such delay. Within  
2 five (5) business days after notifying EPA by telephone,  
3 Respondents shall provide written notification fully describing  
4 the nature of the delay, any justification for delay, any reason  
5 why Respondents should not be held strictly accountable for  
6 failing to comply with any relevant requirements of this Order,  
7 the measures planned and taken to minimize the delay, and a  
8 schedule for implementing the measures that will be taken to  
9 mitigate the effect of the delay. Increased costs or expenses  
10 associated with implementation of the activities called for in  
11 this Order is not a justification for any delay in performance.

12 XXV. ASSURANCE OF ABILITY TO COMPLETE WORK

13 A. Respondents shall demonstrate their ability to complete  
14 the Work required by this Order and to pay all claims that arise  
15 from the performance of the Work by obtaining and presenting to  
16 EPA within thirty (30) days after approval of the Final Removal  
17 Action Work Plan, one of the following: (1) a performance bond;  
18 (2) a letter of credit; (3) a guarantee by a third party; or (4)  
19 internal financial information to allow EPA to determine that  
20 Respondents have sufficient assets available to perform the Work.  
21 Respondents shall demonstrate financial assurance in an amount no  
22 less than the estimate of cost for the American River North  
23 Removal Action contained in the Action Memorandum. If  
24 Respondents seek to demonstrate ability to complete the American  
25 River North Removal Action by means of internal financial  
26 information, or by guarantee of a third party, they shall re-  
27 submit such information annually, on the anniversary of the

1 Effective Date of this Order. If EPA determines that such  
2 financial information is inadequate, Respondents shall, within  
3 thirty (30) days after receipt of EPA's notice of determination,  
4 obtain and present to EPA for approval one of the other three  
5 forms of financial assurance listed above.

6 B. At least seven (7) days prior to commencing any Work at  
7 the American River North Site pursuant to this Order, Respondents  
8 shall submit to EPA a certification that Respondents or their  
9 contractors and subcontractors have adequate insurance coverage  
10 or have indemnification for liabilities for injuries or damages  
11 to persons or property which may result from the activities to be  
12 conducted by or on behalf of Respondents pursuant to this Order.  
13 Respondents shall ensure that such insurance or indemnification  
14 is maintained for the duration of the Work required by this  
15 Order.

16 XXVI. REIMBURSEMENT OF RESPONSE COSTS

17 A. Respondents shall reimburse EPA, upon written demand,  
18 for all response costs incurred by the United States in  
19 overseeing Respondents' implementation of the requirements of  
20 this Order or in performing any response action which Respondents  
21 fail to perform in compliance with this Order. EPA may submit to  
22 Respondents on a periodic basis an accounting of all response  
23 costs incurred by the United States with respect to this Order.  
24 EPA's certified Agency Financial Management System summary data  
25 (SPUR Reports), or such other summary as certified by EPA, shall  
26 serve as basis for payment demands.

27 B. Respondents shall, within thirty (30) days of receipt  
28

1 of each EPA accounting, remit a certified or cashier's check for  
2 the amount of those costs. Interest shall accrue from the later  
3 of the date that payment of a specified amount is demanded in  
4 writing or the date of the expenditure. The interest rate is the  
5 rate established by the Department of the Treasury pursuant to 31  
6 U.S.C. § 3717 and 4 C.F.R. § 102.13.

7 C. Checks shall be made payable to the Hazardous  
8 Substances Superfund and shall include the name of the Site, the  
9 Site identification number, the account number and the title of  
10 this Order. Checks shall be forwarded to:

11 U.S. Environmental Protection Agency  
12 Superfund Accounting  
13 P.O. Box 371003 M  
Pittsburgh, PA 15251

14 D. Respondents shall send copies of each transmittal  
15 letter and check to the EPA's RPM.

16 XXVII. UNITED STATES NOT LIABLE

17 The United States, by issuance of this Order, assumes no  
18 liability for any injuries or damages to persons or property  
19 resulting from acts or omissions by Respondents, or their  
20 directors, officers, employees, agents, representatives,  
21 successors, assigns, contractors, or consultants in carrying out  
22 any action or activity pursuant to this Order. Neither EPA nor  
23 the United States may be deemed to be a party to any contract  
24 entered into by Respondents or their directors, officers,  
25 employees, agents, representatives, successors, assigns,  
26 contractors, or consultants in carrying out any action or  
27 activity pursuant to this Order.

1 XXVIII. ENFORCEMENT AND RESERVATIONS

2 A. EPA reserves the right to bring an action against  
3 Respondents under section 107 of CERCLA, 42 U.S.C. § 9607, for  
4 recovery of any response costs incurred by the United States  
5 related to this Order and not reimbursed by Respondents. This  
6 reservation shall include but not be limited to past costs,  
7 direct costs, indirect costs, the costs of oversight, the costs  
8 of compiling the cost documentation to support oversight cost  
9 demand, as well as accrued interest as provided in section 107(a)  
10 of CERCLA.

11 B. Notwithstanding any other provision of this Order, at  
12 any time during the response action, EPA may perform its own  
13 studies, complete the response action (or any portion of the  
14 response action) as provided in CERCLA and the NCP, and seek  
15 reimbursement from Respondents for its costs, or seek any other  
16 appropriate relief.

17 C. Nothing in this Order shall preclude EPA from taking  
18 any additional enforcement actions, including modification of  
19 this Order or issuance of additional Orders, and/or additional  
20 remedial or removal actions as EPA may deem necessary, or from  
21 requiring Respondents in the future to perform additional  
22 activities pursuant to CERCLA, 42 U.S.C. § 9606(a), et seq., or  
23 any other applicable law. Respondents shall be liable under  
24 CERCLA section 107(a), 42 U.S.C. § 9607(a), for the costs of any  
25 such additional actions.

26 D. Notwithstanding any provision of this Order, the United  
27 States hereby retains all of its information gathering,

1 inspection and enforcement authorities and rights under CERCLA,  
2 RCRA and any other applicable statutes or regulations.

3 XXIX. LIABILITY FOR VIOLATIONS

4 A. Respondents shall be subject to civil penalties under  
5 section 106(b) of CERCLA, 42 U.S.C. § 9606(b), of not more than  
6 \$25,000 for each day in which Respondents willfully violate, or  
7 fail or refuse to comply with this Order without sufficient  
8 cause. In addition, failure to properly provide response action  
9 under this Order, or any portion hereof, without sufficient  
10 cause, may result in liability under section 107(c)(3) of CERCLA,  
11 42 U.S.C. § 9607(c)(3), for punitive damages in an amount at  
12 least equal to, and not more than three times the amount of any  
13 costs incurred by the Fund as a result of such failure to take  
14 proper action.

15 B. Nothing in this Order shall constitute or be construed  
16 as a release from any claim, cause of action or demand in law or  
17 equity against any person for any liability any person may have  
18 arising out of or relating in any way to the Site or the American  
19 River North Site.

20 C. If a court issues an order that invalidates any  
21 provision of this Order or finds that Respondents have sufficient  
22 cause not to comply with one or more provisions of this Order,  
23 Respondents shall remain bound to comply with all provisions of  
24 this Order not invalidated by the court's order.

1 XXX. EFFECTIVE DATE AND COMPUTATION OF TIME

2 This Order shall be effective fifteen (15) days after the  
3 Order is signed by the Regional Administrator or her delegatee.  
4 All times for performance of ordered activities shall be  
5 calculated from this Effective Date.

6 XXXI. OPPORTUNITY TO CONFER

7 A. Respondents may, within ten (10) days after the date  
8 this Order is signed, request a conference with EPA to discuss  
9 this Order. Any such conference shall be held within thirty (30)  
10 calendar days from the date of the request unless extended by  
11 mutual agreement of the parties. At any conference held pursuant  
12 to the request, Respondents may appear in person, or be  
13 represented by an attorney or other representative. If any  
14 Respondent desires such a conference, the Respondent shall  
15 contact Marie M. Rongone, Assistant Regional Counsel, at (415)  
16 744-1313.

17 B. If such a conference is held, Respondents may present  
18 any evidence, arguments or comment regarding this Order, its  
19 applicability, any factual determinations upon which the Order is  
20 based, the response actions required by this Order, the extent to  
21 which Respondents intend to comply with this Order, and any other  
22 relevant and material issue. Any such evidence, arguments or  
23 comments should be reduced to writing and submitted to EPA within  
24 fourteen (14) days following the conference. If no such  
25 conference is requested, any such evidence, argument or comments  
26 must be submitted in writing within fourteen (14) calendar days  
27 following the Effective Date of this Order. Any such evidence,



1 argument or comments shall be submitted to Assistant Regional  
2 Counsel.

3 C. This conference, if requested, is not an evidentiary  
4 hearing, and does not constitute a proceeding to challenge this  
5 Order. It does not give Respondents a right to delay or evade  
6 any activities required by this Order, to seek review of this  
7 Order, or to seek resolution of potential liability, and no  
8 official stenographic record of the conference will be made.

9  
10 So Ordered, this 8<sup>th</sup> day of May, 1995.

11  
12 BY: 

13 Jeffrey M. Zelikson, Director  
14 Hazardous Waste Management Division  
U.S. Environmental Protection Agency  
Region IX

## Appendix A



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
REGION IX  
75 Hawthorne Street  
San Francisco, CA 94105

**MEMORANDUM**

**DATE:** June 30, 1994

**SUBJECT:** Request for a Removal Action at Aerojet General Site,  
Rancho Cordova, Sacramento County, CA

**ACTION MEMORANDUM/ENFORCEMENT**

CERCLIS ID: CAD980358832

Site ID: 16

Category of Removal: Non-Time Critical

Nationally Significant, or Precedent Setting: No

**FROM:** Katherine Moore, RPM *K Moore*  
California Enforcement Section (H-7-3)

**TO:** Jeffrey Zelikson, Director  
Hazardous Waste Management Division (H-1)

**THROUGH:** Nancy Lindsay, Chief *N Lindsay*  
Enforcement Branch (H-7)

**I. PURPOSE**

The purpose of this Action Memorandum is to request approval of the proposed CERCLA non-time critical removal action described herein for the Aerojet-General site located in Rancho Cordova, California ("the Site").

Aerojet General Corporation and Cordova Chemical Company ("Aerojet"), the owner and operator of the facility, will be conducting the removal action under a modification to the Partial Consent Decree entered June 23, 1989 in the United States District Court in the action United States of America vs. Aerojet General Corporation, et. al., Civil Action Nos. CIVS-86-0063 EJG and CIVS-86-0064 EJG ("Consent Decree").

## **II. SITE CONDITIONS AND BACKGROUND**

### **A. Site Description**

The Aerojet operating facility, located in Rancho Cordova, California, was established in the early 1950s. The site was selected, in part, because previous gold dredging operations on large portions of the site had rendered it generally unsuitable for agricultural or residential uses at that time. In 1951, Aerojet began developing, testing, and manufacturing rocket engines for the U.S. government's space exploration and missile programs.

Industrial activities consisted of solid and liquid rocket motor manufacturing and testing, and chemical manufacturing. In addition, between 1977 and 1981, the Cordova Chemical Company, a wholly-owned subsidiary of Aerojet, manufactured paint components, herbicides and pharmaceutical products at the site.

In the past, Aerojet disposed of large quantities of wastes containing hazardous substances, including rocket propellants, herbicides, organic solvents, inorganic compounds, and sewage, by burial, open burning, discharge into unlined ponds, and injection into deep underground wells. These disposal practices have contributed to the surface and sub-surface contamination detected at Aerojet.

The Environmental Protection Agency ("EPA"), Aerojet, the Department of Toxic Substances Control ("DTSC"), and the California Regional Water Quality Control Board ("RWQCB") have identified more than 250 possible locations where organic and inorganic contaminants from Aerojet's operations have seeped into the soil, surface water, and groundwater. Over 100 contaminants have been detected both on and off Aerojet's property. Primary contaminants of concern include VOCs [trichloroethylene (TCE), trichloroethane (TCA), perchloroethene (PCE), dichloroethene (DCE)], chloroform, freon-113, and nitrosodimethylamine (NDMA) and perchlorate.

#### **1. Removal Site Evaluation**

Aerojet is required by the Consent Decree to conduct a Remedial Investigation and Feasibility Study (RI/FS), monitor public and private water supply wells, sample the American River and evaluate the existing groundwater treatment facilities.

This removal action is limited to the plume migrating off the Aerojet facility in the vicinity of the American River. As required by the Remedial Investigation (RI) Accelerated Off Site Investigation (AOI) Work Plan (1990), Aerojet installed monitoring wells north and south of the American River. In 1991, sampling of these wells confirmed that chemicals -- TCE, 1,1-DCE, Freon-113, and perchlorate -- had moved in the groundwater to the

north of the river. TCE is the most prevalent of these chemicals with the highest concentration detected in the middle aquifer at 4,550 ug/l. All of this data was presented to EPA, DTSC and RWQCB (collectively, "the Agencies") in the Revised Scoping Operable Unit Analysis Report (OUA, 1991).

The OUA was disapproved by the Agencies. Subsequently, Aerojet developed a Focused Operable Unit Conceptual Work Plan and Schedule which were approved by the Agencies in February 1992.

Based on the findings of the AOI and OUA Reports, the Agencies became aware that the American River does not provide a barrier to the contaminated plume migrating from Aerojet. Further, this data showed that without intervention, downgradient Fair Oaks drinking water supply wells would be impacted before the Remedial Investigation and Feasibility Study (RI/FS) was completed for the site. Additionally, this data established that contaminants may be entering the American River.

The Agencies determined that at least six months of planning time existed before onsite activities could commence and that an Engineering Evaluation/Cost Analysis (EE/CA) should be prepared. Aerojet subsequently developed an EE/CA which the Agencies approved in June 1993. A public comment period was held on the EE/CA from July 14, 1993 to September 20, 1993. Significant comments were received. In order to respond to these comments, additional monitoring wells and hydraulic modeling were completed. EPA's Response to Significant Comments describing this work is attached to this Action Memorandum. Documentation of the additional work performed is included in the Administrative Record.

## **2. Physical location**

Aerojet is located east of the community of Rancho Cordova, California, in an unincorporated area of Sacramento County, approximately 15 miles east of downtown Sacramento. The facility consists of an 8,500 acre tract of land bordered on the west by Folsom South Canal, on the south by White Rock Road, on the east by Prairie City Road, and on the north by Folsom Boulevard and U.S. Highway 50. The American River flows westwardly, less than one mile north of the site. The Aerojet Site includes the majority of the Aerojet operating facility plus three additional off-site areas referred to as Areas 39, 40 and 41.

Commercial and industrial facilities are located adjacent to the site along Highway 50. The Gold River residential community is located directly northwest of the site across Highway 50, and the residential communities of Fair Oaks and Orangevale are north of the site on the northern side of the American River. The northern boundary of the site is within a 1/2 mile of the American River and Lake Natoma. Folsom Lake State Recreation

Area is within 1 mile of the site to the north. The Nimbus Fish Hatchery is located north of the Aerojet site along the south side of the American River. To the south and east of the site are agricultural lands with scattered farms or ranch houses. An off-highway vehicle park is located to the south of the southeast corner of the site. Light industrial and commercial land use exists to the west of the site, and the community of Rancho Cordova is located west of these uses. Approximately 40 percent of the industrial land in Rancho Cordova is occupied by Aerojet.

### **3. Site Characteristics**

Aerojet manufactures and tests liquid and solid rocket motors. Processes at Aerojet included mixing, casting, molding, or extruding solid propellant fuel and oxidizer compounds, curing them, and loading the charges into the thrust chamber assemblies or metal casting. Some specialty chemicals were manufactured at Cordova Chemical Company Plants 1 and 2.

This removal action addresses the groundwater plume migrating from the Aerojet facility boundary to the north of the American River. The area is referred to as the American River Study Area (ARSA). The removal action site includes the Sailor Bar County Park portion of the American River Parkway. Sailor Bar Park is located on the north side of the American River, between Hazel Avenue on the east and a point upstream of the old Fair Oaks Bridge on the west. The park area encompasses approximately 375 acres. The park is bounded on the north by the base of the Fair Oaks bluffs and on the south by the American River. The developed residential community of Fair Oaks is at the western, northern, and eastern boundaries of the park. The contaminated plume migrates beneath the residential community.

The upper hydrostratigraphy has been divided into three aquifers -- upper, middle, and lower. The three aquifers tend to be thicker in the eastern portion of the area near the fish hatcheries and become thinner to the west.

Contaminants, primarily VOCs, have been identified in the three aquifers. The five most common VOCs detected are as follows: trichloroethylene (TCE), freon-113, cis- and/or trans-1,2-dichloroethylene (c/t-1,2-DCE), 1,1-dichloroethylene (1,1-DCE), and perchloroethylene (PCE). Three tentatively identified compounds (TICs) that have been quantified are 1,4-dioxane, n-butyl-benzene-sulfonamide, and 1-methyl-2-pyrrolidinone.

The highest concentrations of TCE are located in the central part of the study area under the western portion of the fish hatchery property. In the middle aquifer, the 1,000 ug/l contour line extends to the north side of the American River. The highest TCE concentrations and farthest downgradient migration of the plume are within the middle aquifer.

#### **4. Release or threatened release into the environment of a hazardous substance or pollutant or contaminant**

The American River is used as a municipal and agricultural water supply. It is also a significant recreational, fishery and wildlife resource; it serves as a return stream for salmon during the fall that were originally refused from the fish hatchery. Water flow in the river is controlled primarily by Folsom Dam, and to a lesser extent, by Nimbus Dam. In 1983, VOC contamination was found in the American River during a low flow period, when the California Department of Fish and Game (CDFG) reduced the water level to inspect its fish ladders. The RWQCB found several seeps along the riverbank that were discharging groundwater containing five types of VOCs, including TCE. The City of Sacramento and the Carmichael and Arcade Water Districts draw water from the American River downstream of the contaminated seeps. The concentration of TCE in water pumped from the river for public consumption has remained consistently below the detection limit, which is 0.5 ppb. In addition, Aerojet is required to sample the American River regularly as part of the RI/FS activities at the site. VOCs have not been detected in any of the samples collected under this program.

As part of the AOI, Aerojet collected soil vapor samples on the south side of the American River. Analysis of vapor samples showed VOCs in only two of the samples at 7.7 and 4.3 ppb respectively.

Based upon these relatively low levels in surface water and in soil vapor, this removal action will focus on the groundwater contamination only.

Sampling of the groundwater indicates that VOCs are present at concentrations and quantities which exceed the State Action Levels (5 ppb for both TCE and PCE). The source of these contaminants can be directly related to potential source locations on the Aerojet facility.

#### **5. NPL Status**

The Site was listed on the NPL in 1979. As required by the Consent Decree, a phased RI/FS is in progress and a risk assessment is underway.

#### **6. Maps of the Site**

Attached to this memorandum is a map of the American River Study Area (ARSA). The middle aquifer TCE plume was estimated using common methods. Other maps, showing other contaminants and aquifers, are included in the EE/CA.

## **B. Other Actions to Date**

Implementation of the site-wide groundwater investigation over the last several years has resulted in the installation of more than 1500 groundwater monitoring wells at locations throughout the Aerojet site. In addition, five groundwater extraction and treatment (GET) facilities are currently operating on site in an effort to prevent further movement of contaminants off-site. The GETs (known as A, B, D, E, and F) are each comprised of a series of extraction wells, groundwater treatment systems, recharge networks, and/or surface discharge. These were designed and constructed in 1980-1987 by Aerojet General, independent of State or EPA direction or oversight, to intercept groundwater as it moves off the facility boundary.

All the GETs use air stripping to remove VOCs. GETs F and D are also equipped with activated carbon to remove VOCs from the air; however the GET D system has never been activated. In addition to VOCs, GETs A & B are designed to treat NDMA, which is a byproduct from the test burning of liquid rocket fuel. After air stripping, the extracted groundwater is discharged into asphalt-lined surface impoundments and treated via photodegradation. GET A and GET B discharge upgradient of the facilities to areas of mine tailings. The treated GET A and B effluents are recharged (via percolation) into groundwater before leaving the site. Treated effluent from GETs D, E, and F is recharged in the aquifer.

## **C. State and Local Authorities Roles**

### **1. State and Local Action to Date**

Under the Consent Decree, EPA, DTSC, and RWQCB all must approve or disapprove the deliverables and work. A Memorandum of Understanding (MOU) has been signed by the Agencies to resolve any disputes arising from implementation of the Consent Decree. DTSC has also entered into an agreement with the Sacramento Air Pollution Control District for technical support during the implementation of the Consent Decree.

### **2. Potential for Continued State and Local Response**

At the completion of the first site Record of Decision ("ROD"), a Remedial Design/Remedial Action ("RD/RA") Consent Decree will need to be negotiated. This is scheduled to occur in 1996.

## **III. Threat to Public Health or Welfare or the Environment**

### **A. Threats to Public Health or Welfare**

The media of concern is groundwater. The downgradient drinking water wells are the Fair Oaks water supply wells. The



Carmichael, Arden-Cordova and Folsom-Cordova Unified School District Wells are also in the vicinity, downgradient of the Fair Oaks water supply wells.

Pursuant to Section 300.415(b)(2) of the National Contingency Plan (NCP), the following condition necessary for initiating a removal action exists:

Actual or potential contamination of drinking water supplies -- The drinking water aquifer is contaminated with VOCs which are possible and/or probable human carcinogens.

**B. Threats to the Environment**

The contamination is primarily underground, posing a threat to the aquifers. The contamination is presently in the local aquifers and may spread into the regional aquifer. The American River is also potentially threatened as VOCs may be entering the river. Based upon frequent sampling, any VOCs which may be currently entering the American River are at low levels and appear to be diluted by the river to undetectable levels.

**C. Streamlined Risk Evaluation**

The following risk evaluation shows the need for this removal action. It is not a completed baseline risk assessment, yet enough information is available to demonstrate the potential for risk. Data is used from the plume to identify contaminants of concern, to provide an estimate of the extent to which people might be exposed to these contaminants, and to provide an assessment of the risk associated with these contaminants.

**1. Contaminants of Potential Concern**

Based on data gathered by Aerojet and presented in the EE/CA, the contaminants listed in the following table have been identified as contaminants of potential concern for the ARSA as compared to the state and federal MCLs. These were chosen based on quantity, toxicity and potential to move into critical exposure pathways, which for this removal action is the drinking water supply. Additional contaminants of potential concern will be addressed in the baseline risk assessment to be done as part of the RI/FS.

CONTAMINANT	HIGHEST CONC. DETECTED	FEDERAL MCL	STATE MCL	EXCEED MCL ?
Carbon Tetrachloride	8	5	0.5	YES
1,1 Dichloroethane	45	-- <sup>1</sup>	5	YES
1,2 Dichloroethane	46	5	0.5	YES
1,1 Dichloroethylene	120	7	6	YES
cis/trans-1,2- dichloroethylene	270	70 (cis) 100 (trans)	6 (cis) 10 (trans)	YES
1,4-Dioxane	53	-- <sup>2</sup>	-- <sup>3</sup>	EXCEED PRG <sup>4</sup>
Freon-113	502	-- <sup>5</sup>	1200	NO
Tetrachloroethylene	89	5	5	YES
1,1,1-Trichloroethane	8	200	200	NO
Trichloroethylene	4,550	5	5	YES
Vinyl Chloride	2	2	0.5	YES

Except for 1,1 dichloroethane, cis/trans-1-2-dichloroethylene, and freon-113, each of these contaminants is considered a possible and/or probable human carcinogen. These three chemicals have also been identified as contaminants of potential concern because they have non-carcinogenic health effects.

## 2. Exposure Assessment

### a) **Potential Receptors:**

The primary potential receptors are the residents of the Fair Oaks area. Wells serving drinking water to these residents

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<sup>1</sup>A Federal MCL for 1,1 Dichloroethane has not been established

<sup>2</sup>A Federal MCL for 1,4 Dioxane has not been established

<sup>3</sup>A State MCL for 1,4 Dioxane has not been established

<sup>4</sup>Preliminary Remediation Goal

<sup>5</sup>A Federal MCL for Freon-113 has not been established

are approximately one mile from the leading edge of the plume. Further migration of the plume in the ARSA would most likely require the installation of treatment systems at these wells.

An additional potential receptor is the recreational user of the American River. However, the concentration of contaminants potentially entering the American River at low flow conditions from the upper aquifer are very low (usually close to the detection limit) as compared to the values found in the middle aquifer groundwater. At normal flow conditions, no contaminants have been detected in the American River. Also, any contaminants entering the American River are volatilized and/or diluted. Based on these facts, and considering that the recreational user of the river would be exposed for short periods of time on an intermittent basis, we believe that this potential receptor is not significantly affected. This issue will be further evaluated in the Site-wide RI/FS.

#### **b) Pathways:**

The pathways of concern are ingestion and inhalation through domestic use of the groundwater.

For purposes of estimating exposure, standard exposure assumptions were used (OSWER Dir. 9285.6-03). These assumptions include a water ingestion rate of 2 liters/day and an inhalation rate of 20 cubic meters/day for 30 years for a 70 kilogram (154 lb.) person.

### **3. Screening Risks**

The following table compares the maximum concentration of contaminants detected in groundwater to the health-based concentration for a maximally exposed individual. All carcinogenic contaminants which exceed either the federal MCL, state MCL, or Preliminary Remediation Goal (PRG) are presented.

EPA considers a risk of  $10^{-3}$  (1 person in 1,000) to be a principal threat. EPA also calculates a risk of  $10^{-6}$  based on EPA Region 9's 1993 Preliminary Remediation Goals for tap water. As part of the RI/FS, a complete baseline risk assessment will evaluate the risk of multiple contaminants of concern and potential and competed multiple pathways. However, based upon the information shown in the following table, EPA believes that it is appropriate to take action to control the source of contamination and the continued migration of the plume.

According to the following table, a concentration of 2500 ppb TCE and a concentration of 68 ppb 1,1 DCE would constitute a principal threat (1 in 1,000 risk or more) to maximally exposed individuals. The concentrations of each of these chemicals actually detected in the Aerojet plume are significantly higher than the levels considered to pose a principal threat.

CONTAMINANT	HIGHEST CONC DETECTED	10-6 RISK	10-3 RISK	PRINCIPAL THREAT?
Carbon Tetrachloride	8	0.26	260	NO
1,2 Dichloroethane	46	0.20	200	NO
1,1 Dichloroethylene	120	0.068	68	YES
1,4 Dioxane	53	1.6	1600	NO
Tetrachloroethylene	89	1.4	1400	NO
Trichloroethylene	4550	2.5	2500	YES
Vinyl Chloride	2	0.028	28	NO

#### 4. Uncertainties

Some of the uncertainties to be taken into account when estimating risk are:

- a. Risk calculations are based on studies done on animals and it is difficult to determine exactly what effect these chemicals potentially have on humans.
- b. Test animals are given high doses of chemicals. There is uncertainty as to whether or not low dose information can be extrapolated from these studies.

Conclusion: Despite these uncertainties, it is appropriate that EPA take immediate action to control the source of this contamination and prevent the plume from further contaminating the nearby drinking water well.

#### IV. **ENDANGERMENT DETERMINATION**

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the removal action selected in this Action Memorandum, may present an imminent and substantial endangerment to public health, welfare and the environment.

This endangerment determination, as supported by Section III of this Action Memorandum, is based upon national and Region 9 Superfund Guidance and has been made by an EPA staff toxicologist.

## **V. PROPOSED ACTIONS**

### **1. Proposed Action Description**

As described in the EE/CA, Aerojet will construct an extraction and treatment system in order to control the source of contamination, reduce the contaminant plume and limit the potential migration to the nearby drinking water wells.

Groundwater will be extracted from extraction wells on the north side of the American River and treated to remove the contaminants by a granular activated carbon (GAC) system. The treated water will then be recharged downgradient from the VOC plume. The treatment system will reduce contaminants to levels that meet State of California reinjection requirements. A complete description of the groundwater extraction and treatment system can be found in the EE/CA which is included in the Administrative Record.

It is very common in the field of groundwater remediation that even the best system design, based on extensive data and complex modeling, will not affect the plume as estimated. Therefore, it is important to consider groundwater cleanup actions as an iterative process, requiring ongoing evaluation of system design, cleanup time frames, data collection needs and system modification. The Agencies will closely monitor the performance and impact of this removal action system. As needed, the system will be modified to better establish capture based upon the actual operation as opposed to estimated values.

In addition, the Agencies have already determined that a supplemental EE/CA shall be prepared by Aerojet for the area south of the American River. This supplemental EE/CA requirement is described at Section (V)(6) below. The Agencies anticipate issuing a supplement to this Action Memorandum based on the results of the supplemental EE/CA.

This removal action will accomplish three important goals: 1) extract contaminated groundwater, treat it to below drinking water standards, and return clean water back to the aquifer; 2) prevent additional downgradient migration of contamination; and, 3) provide additional data to perform analysis which will determine if modifications, such as additional extraction wells, are needed. Future remedial and/or removal actions will be proposed in accordance with the Comprehensive, Environmental Response Compensation and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA).

### **2. Contribution to Remedial Performance**

This removal action is consistent with the overall strategy to clean up the groundwater at this Site. By containing and

reducing the VOC plume, EPA is ensuring that the plume will not spread and endanger public health or the environment.

An RI/FS of the ARSA, as well as the entire Aerojet property, is ongoing. Further soil and groundwater investigation is required before a remedial action can be selected.

### **3. Description of Alternative Technologies**

In the EE/CA, Aerojet and the Agencies have evaluated the following remedial technologies for possible implementation at the north side of the ARSA:

- Air Stripping with Emission Control
- Aqueous Phase Carbon Adsorption
- Steam Stripping
- Liquid-Liquid Extraction
- UV Oxidation
- Biological Degradation
- Distillation

The Agencies and Aerojet rejected some of these treatment technologies in favor of proven, readily available pump-and-treat technologies which are widely used to clean up groundwater contamination. The remaining technologies evaluated include:

- Aqueous Phase Carbon Adsorption
- Air Stripping with Emission Control
- UV Oxidation

Effluent Discharge options evaluated were the following:

- Discharge to publicly owned treatment works
- Use by local water authority
- Discharge to the American River
- Recharge/Reinjection

The treatment alternative recommended by the Agencies and Aerojet for treatment of VOCs on the north side of the American River is Aqueous Phase Carbon Adsorption with recharge of the treated effluent. The State of California, as represented by DTSC and RWQCB, has stated a preference and concurs with EPA on the selection of this alternative.

Aqueous Phase Carbon Adsorption is selected for the following reasons:

1. Simplicity of process control;
2. Process produces no noise;
3. Monitoring and maintenance is comparable to Air Stripping;

4. No air emissions;
5. Minimal space is required for treatment unit; and
6. Low capital cost, moderate to high operation & maintenance costs.

Potential problems associated with Carbon Adsorption are rising operation and maintenance costs associated with rising concentration of VOCs. Also, Carbon Adsorption will not remove 1,4-dioxane.

Based on current modeling results, it is predicted that within five years, 1,4-dioxane may reach action levels requiring treatment at the extraction well locations. This prediction is based on plume models and the average rate of groundwater movement in the aquifers of concern.

Carbon Adsorption and Air Stripping are both incapable of treating 1,4-dioxane in groundwater. Treatment of 1,4-dioxane will require the use of a UV Oxidation system unless a more cost effective technology is identified. However, use of a UV Oxidation system alone now for the treatment of VOCs is not cost effective. A Carbon Adsorption system will be operational within one year, operated for approximately five years and then a UV Oxidation system may be added as needed as treatment of 1,4-dioxane. An added benefit of the addition of UV Oxidation treatment later on is that the UV Oxidation system will also treat some of the VOCs, thus reducing long term carbon usage. This issue will be evaluated further in the on going evaluation of the RI/FS which includes the ARSA.

#### **4. Engineering Evaluation/Cost Analysis (EE/CA) and EE/CA Approval Memorandum**

The EE/CA (without appendices) and EE/CA Approval Memorandum are attached to this Action Memorandum for reference. The entire EE/CA, with appendices, is included in the Administrative Record.

#### **5. Applicable or relevant and appropriate requirements (ARARs)**

In accordance with 40 CFR 300.415(i), EPA shall, to the extent practicable considering the exigencies of the situation, attain applicable or relevant and appropriate requirements under federal and state environmental laws. The State of California identified State ARARs, in a timely manner, during the EE/CA development. The action will comply with the following ARARs.

1. State and Federal Drinking Water Standards as set in the
  - a) Safe Drinking Water Act, and
  - b) Title 22 of the California Code of Regulations.
2. California Safe Drinking Water and Toxic Enforcement Act of 1985 (Proposition 65).

3. Resource Conservation Recovery Act (RCRA) of 1976 as amended by the Hazardous and Solid Waste Amendments of 1984.
  4. California Code of Regulations, Division 4.5, Chapter 11.
  5. Underground Injection Control Program as established by the Clean Water Act.
  6. Porter-Cologne Water Quality Control Act (Division 7 of the California Water Code) California Code of Regulations, Title 23, Division 3, Chapter 15.
  7. Regional Water Quality Control Board, Central Valley Regional Basin Plan.
  8. California State Water Resources Control Board Resolution Numbers 68-16 and 88-63.
- 6. Project Schedule**

Aerojet will submit a design schedule in accordance with the modified Consent Decree. The Agencies anticipate that the pump and treat system will be constructed and operating within twelve months of the execution of the modification to the Consent Decree which will memorialize Aerojet's obligation to perform this removal. As part of the ongoing program, the system will be evaluated by the Agencies to determine its effectiveness in meeting the removal action goals. If necessary, the system will be adjusted and continue operation until it is incorporated into the future remedial action for the ARSA.

Based upon groundwater monitoring and modeling, Aerojet has proposed and the Agencies maintain that a groundwater extraction and treatment system should be installed in the area immediately south of the American River ("American River South Groundwater Extraction and Treatment (GET) Facility"). Aerojet shall present an analysis of the alternatives for this GET Facility in a supplement to the ARSA EE/CA. After review and approval of the supplemental EE/CA by the Agencies, a supplemental Action Memorandum will be prepared by EPA.

**B. Estimated Costs**

This Action Memorandum is for a removal to be performed by the responsible party. The cost estimates included in the EE/CA were based on a flow rate of 910 gpm. Based upon the supplemental three-dimensional modeling performed, the Agencies have estimated that the flow rate will be significantly higher. New cost estimates were calculated. Therefore, at an estimated flow rate of 2000 gpm, Aerojet has estimated the cost of the action as follows:



Extraction Wells & Carbon Treatment

Capital Cost	\$700,000
Operation & Maintenance	416,000/yr
Present Worth	\$5,884,000

Recharge as Discharge of Effluent

Capital Cost	\$800,000
Operation & Maintenance	28,000/yr
Present Worth	\$1,148,000

**TOTAL PRESENT WORTH** **\$7,032,000**

Contingency costs are inherent in the methods used for estimation of these costs. Aerojet has agreed to pay EPA's intramural costs according to the terms of the modified Consent Decree. Therefore, no estimate of EPA's intramural costs has been prepared.

**VI. EXPECTED CHANGE IN THE SITUATION SHOULD ACTION BE DELAYED**

If this removal action is not performed, the VOCs will continue to migrate toward the municipal drinking water wells.

**VII. OUTSTANDING POLICY ISSUES**

No outstanding policy issues have been identified at this time.

### VIII. RECOMMENDATION

This Action Memorandum documents the selected removal action for the Aerojet General Superfund site in Rancho Cordova, Sacramento County, California in accordance with CERCLA, as amended by SARA, and the National Contingency Plan. This decision is based on the Administrative Record for the Site.

Because conditions at the Site meet the NCP section 300.415(b)(2) criteria for removal, I recommend your approval of the proposed removal action.

  
Approval Signature

6-30-94  
Date

\_\_\_\_\_  
Disapproval Signature

\_\_\_\_\_  
Date

Attachments:    1. ARSA Map  
                  2. Response Summary  
                  3. ARSA EE/CA (w/o appendices)  
                  4. EE/CA Approval Memorandum

cc: Raymond Leclerc, CA Department of Toxic Substances (w/o attachments 3 & 4)

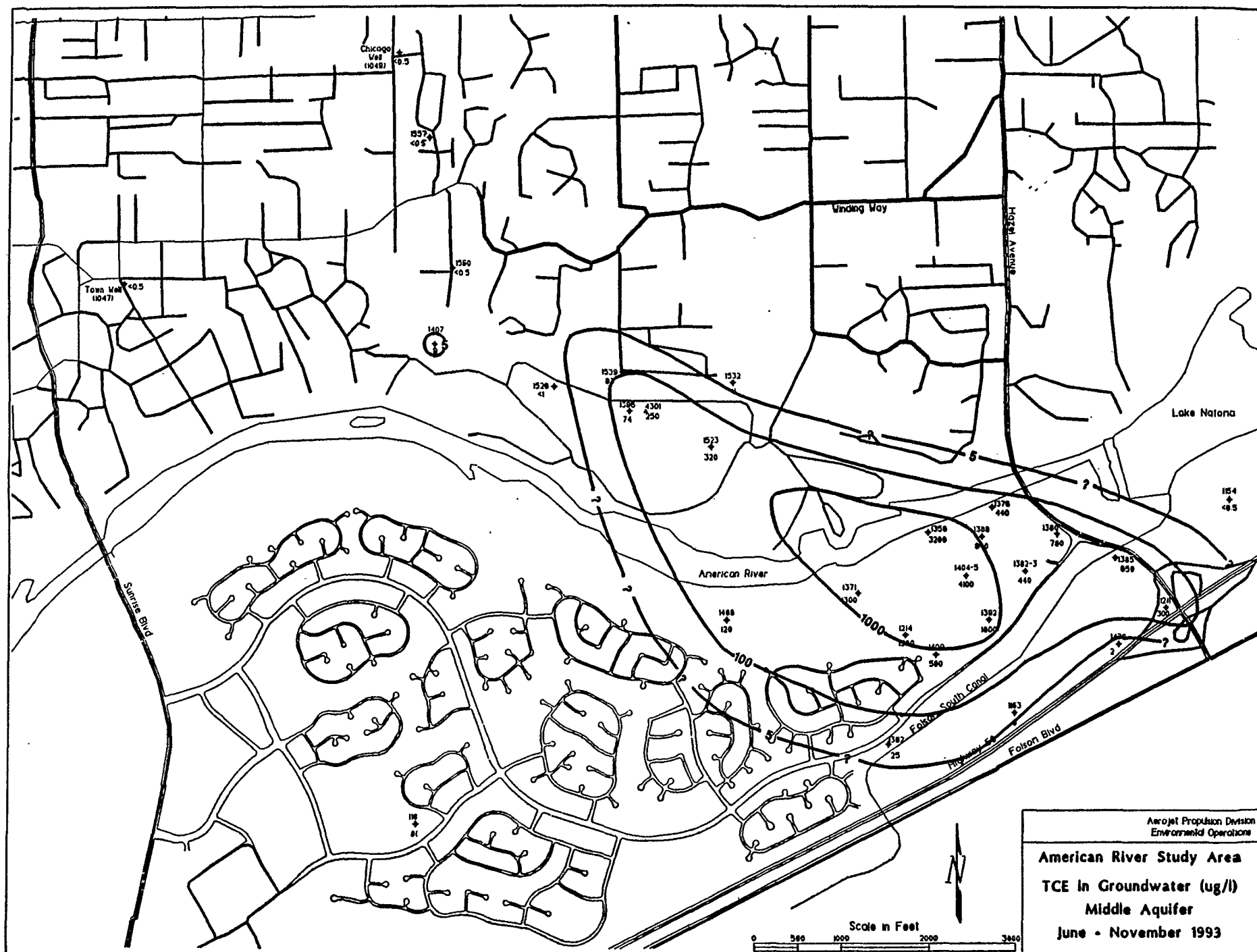
Robert Yeadon, CA Regional Water Quality Control Board (w/o attachments 3 & 4)

Cindy Caulk, Aerojet General (w/o attachments 3 & 4)

Jose Uranga, Aerojet General (w/o attachments)

Lawrence Hobel, Heller, Ehrman, White & McAuliffe (w/o attachments)

**ATTACHMENT 1 - MAP OF AMERICAN RIVER  
STUDY AREA**



**ATTACHMENT 2 - RESPONSE SUMMARY**

**Response Summary of Comments Received on  
the Proposed Removal Action at the  
American River Study Area (ARSA) at the  
Aerojet General Superfund Site in Rancho  
Cordova, California**

**TABLE OF CONTENTS**

<b>Introduction . . . . .</b>	<b>2</b>
<b>Summary of Additional Work . . . . .</b>	<b>3</b>
<b>Summary of Modifications to the Proposed Action . .</b>	<b>5</b>
<b>Oral Comments Received at the Public Availability Sessions . . . . .</b>	<b>6</b>
<b>Written Comments Received During the Public Comment Period . . . . .</b>	<b>8</b>
Remy & Thomas on behalf of Fair Oaks Water District (8/13/93) . . . . .	8
Carmichael Water District (8/17/94) . . . . .	15
Miscellaneous Public Comments (various dates) . . . . .	18
Carmichael Water District (9/16/93) . . . . .	19
Remy and Thomas, on behalf of the Fair Oaks Water District (9/20/93) . . . . .	21
<b>Miscellaneous Oral Comments Received During the Public Comment Period . . . . .</b>	<b>37</b>

## Introduction

The purpose of the Response Summary is to provide EPA's response to the significant comments received from the public on EPA's cleanup proposal for VOCs in the groundwater at the American River Study Area of the Aerojet General Superfund Site. EPA received two kinds of comments -- formal written comments during the public comment period and informal oral questions and comments received during the public availability sessions. EPA is required by law to address only the formal comments, if they are significant. These comments are made with intent of being included in the Administrative Record. However, EPA has elected to respond to all significant comments, both written and oral.

EPA provided a public review and comment period on the proposed removal action and Engineering Evaluation/Cost Analysis (EE/CA) for the removal of VOCs in the groundwater at the American River Study Area from July 14, 1993 to August 13, 1993. In response to a request from the Carmichael Water District (CWD), EPA extended the public comment period to September 20, 1993. The Administrative Record for this removal action was also available for public comment during this time period.

On August 18, 1993, EPA held a public availability session at Mills Junior High School in Gold River, California. At the request of David Cox, Sacramento County Supervisor, EPA also attended a meeting on September 8, 1993 with local residents who live on or near Emperor Drive in Fair Oaks, California, to discuss the proposed removal action.

A number of comments were received during the comment period, the most extensive of which were received from the Fair Oaks Water District (FOWD) and the CWD concerning the effect of the removal action on the local groundwater system. In addition, a number of comments were received from the local residents concerning the noise and physical disruptions in the area anticipated to be caused by the project.

To adequately address the technical comments, additional data were collected and analyzed. This work included 1) the installation and sampling of two multiple completion monitoring wells, 2) completion of pumping tests on the contaminated aquifers, and 3) completion of additional groundwater modeling. As the work was completed, the results were shared with the affected communities, the FOWD and the CWD. This supplemental effort is summarized in the "Summary of Additional Work" portion of this Response to Comments. Also, documentation in support of the additional work performed is included in the Administrative Record.

## Summary of Additional Work

After issuance of the EE/CA, additional characterization work was conducted to enhance EPA's understanding of the extent of contamination, to collect information for design specifications and to address comments made during the public comment period. This work included: installation and sampling of two multiple completion monitoring wells, completion of pumping tests on the contaminated aquifers, and completion of additional groundwater modeling.

Two additional multiple completion wells were installed near the downgradient edge of the plume between a monitoring well within the plume and the FOWD water supply wells. These wells were installed to ensure that the location of the groundwater contamination target area in the EE/CA is accurate. The new wells are located on Oak Glen Way and Greenvale Road in Fair Oaks. Each well has a screened interval (a groundwater sample can be taken from this interval) in the aquifers that have been shown to be contaminated upgradient -- the upper, middle, and lower aquifers -- as described in the EE/CA. The exact locations, cross section and chemical data for the wells are included in the Administrative Record.

The chemical results from the analysis of groundwater from these wells show that trichloroethylene (TCE, the most common contaminant at the ARSA) was not detected above the detection limit of 0.5 parts per billion (ppb). In addition, no other contaminants were found above the detection limits. The location of these wells was coordinated with the FOWD and CWD to ensure that the wells would address their concerns regarding the extent of contamination. EPA concludes that the results from these wells indicate that the location of groundwater contamination identified in the EE/CA is accurate.

During the months of September and October 1993, pumping tests were conducted on three wells located in Sailor Bar Park. The location of these wells and detailed description of the pumping tests are included in the Administrative Record. These tests were conducted to better define the aquifer characteristics, such as permeability and transmissivity, and to gather more detailed data for system design. Each well was pumped and measured separately. Finally, all wells were tested simultaneously to estimate parameters for each aquifer and to estimate the impact when the wells operated together as proposed in the EE/CA. The results from the test indicated that the upper aquifer is more transmissive (transmissivity is an aquifer parameter that describes the potential of an aquifer to produce water), the middle aquifer is about the same, and the lower aquifer is less transmissive than estimated in the EE/CA. These estimated differences will not significantly alter the effectiveness of the action. However, they do indicate that the flow of water from an individual well may be higher or lower than originally estimated. The purpose of the



extraction wells is to establish a hydraulic zone of capture that will include the zone of contamination. Therefore it is anticipated that flow rates from each individual extraction well may be different from the anticipated value, but that the goal for drawdown and zone of capture will remain constant.

The data collected from the new wells and the pumping tests were used in a new groundwater modeling effort. This modeling was conducted by CH2M Hill, a contractor for EPA. The model can simulate a three dimensional flow and the effects from the extraction and recharge wells. The model is based on the hydrogeologic scenario described in the EE/CA, supplemented and modified by the results from the pumping tests. CH2M Hill's final modeling report is included in the Administrative Record.

The modeling results indicated that the implementation of the removal action recommended in the May 1993 EE/CA is an environmentally sound first step in an iterative approach to control the migration of the contaminant plume in the ARSA. However according to the results of this new modeling effort, a significantly higher extraction rate will most likely be needed to completely capture the TCE target area in the upper, middle and lower aquifers. Also, an extraction well network to contain the contamination will require additional upper, middle, and lower aquifer wells on the north and south sides of the American River. And finally, the report concludes that recharge of groundwater in the proposed locations of the May 1993 EE/CA will not accelerate contaminants of the identified contaminant target area towards the Fair Oaks Water Supply Wells, even at the maximum pumping rate. The report also recommends that Aerojet develop a specific plan of action to closely monitor the actual response of the aquifer and influence on the contaminant plume in the ARSA.

## Summary of Modifications to the Proposed Action

As a result of the Additional Work Performed, EPA has determined that modifications to the proposed action in the EE/CA are needed. An Addendum to the Administrative Record provides the documentation for these modifications. A summary is provided below:

1. Recharge Wells - The location of the recharge wells has been moved approximately 500 feet downgradient of the location presented in the EE/CA. The wells will still be placed within the boundary of Sailor Bar Park, at the very northwestern edge. Additionally, deeper recharge is proposed.
2. Design Flow Rate - The design flow rate has been revised from 900 gallons per minute (gpm) to 2000 gpm. The cost estimates have been revised to reflect this change.
3. Additional Extraction Locations - Additional extraction well locations are recommended on the south and north sides of the American River. The exact locations and treatment methods will be determined as part of the ongoing CERCLA response action for the ARSA.

## Oral Comments Received at the Public Availability Sessions

### Comment #1

A resident of Argonaut Village, Gold River, California, expressed a concern that VOCs could migrate from the deeper depths to the shallower depths into the residences above the groundwater plume.

### Response

While it is possible that vertical migration could occur, it is extremely unlikely that human exposure to contaminants would be significant given the circumstances of the groundwater contaminant plume in the American River Study Area (ARSA). Appendix H of the EE/CA, Screening Level Evaluation of Potential Carcinogenic Risk for Exposure to TCE in Soil Vapor and Soil Vapor Data, addresses the potential for vertical migration of the contaminants. This evaluation concluded that the cancer risk for this potential migration was below a one in million risk. (The potential carcinogenic risk for a resident from potential air emissions was calculated to be  $9.4 \times 10^{-7}$ .)

A conservative approach was taken to determine this conclusion. Soil vapor samples were collected at eleven locations throughout the ARSA including the area overlying the portion of the plume (the vadose zone) with the highest volatile organic compound (VOC) contamination. Only TCE was found at 4 and 8 parts per billion (ppb) in soil vapor at two locations. As part of EPA's ongoing investigation, additional soil gas samples will be collected in the Gold River Community. EPA will then evaluate what actions are needed in response to these ongoing investigation results.

### Comment #2

Many residents of Gold River and Fair Oaks expressed concerns regarding the quality of the drinking water provided to their homes.

### Response

The contaminated groundwater in the ARSA is not presently used as a drinking water source. The drinking water supplied to Gold River and Fair Oaks residents is supplied by various Sacramento area water districts. Residents are referred to these local agencies to receive water quality data for their area. However, the contaminated groundwater plume is located in an aquifer that is a potential source of drinking water.

Comment #3

Residents who own homes above the contaminated plume expressed concern about the property values of their homes due to the contamination.

Response

EPA is not equipped, and does not have the capability to determine property value impacts due to contamination in the vicinity of private residences. EPA acknowledges these residents' concerns, but is unable to respond to them based on these limitations on its expertise and resources. Local real estate professionals may be able to provide information regarding this concern.

Comment #4

Fair Oaks residents living close to Sailor Bar Park expressed concern that construction activities will be noisy and disruptive to their neighborhood.

Response

EPA acknowledges these residents' concerns. However, there are practical limitations for the location of the wells and treatment plant to be built in Sailor Bar Park. First, the placement of groundwater extraction wells must be located directly above the contaminated groundwater and second, the treatment plant must be in the vicinity of the extraction wells. The land surface above the contamination includes Sailor Bar Park and otherwise mostly private residences. The use of residential property is not preferred for the location of extraction/recharge wells and treatment plants for obvious reasons. EPA recognizes the community's desire to preserve the natural setting of Sailor Bar Park and therefore, the treatment plant will be located near the existing County Water Treatment Lift Station. All associated piping will be underground.

Additionally, EPA will do all it can to minimize the noise, dust, and nuisance to the surrounding community during the time of construction in Sailor Bar Park. Residents are encouraged to contact EPA, the State of California, and/or Aerojet if specific concerns arise. The addresses and phone numbers are as follows:

US Environmental Protection Agency	CA Department of Toxic Substance
Superfund Programs	10151 Croydon Way
75 Hawthorne Street	Sacramento, CA 95827
San Francisco, CA 94105	(916) 255-3712
(415) 744-2247	
(800) 231-3075	

## Written Comments Received During the Public Comment Period

### Remy & Thomas on behalf of Fair Oaks Water District (8/13/93)

The Fair Oaks Water District provided comments to EPA in a letter dated August 13, 1993. These comments were "incorporated by reference" in a letter dated September 20, 1993 from Remy & Thomas on behalf of the FOWD. Most of these comments were generated without the benefit of reviewing the EE/CA. At that time, Fair Oaks Water District was only aware of the "Initial Study" and "Proposed Negative Declaration" prepared by the California Department of Toxic Substances Control (DTSC). EPA believes that many of these comments were specific to the Initial Study and the Negative Declaration. Therefore, EPA has not provided a response to comments which were specifically identified as concerns regarding the Initial Study and Negative Declaration, unless there is relevance to the EE/CA. The CA DTSC intends to respond to these comments in a separate document, as appropriate. Below, EPA responds only to those comments with relevance to the EE/CA.

#### Comment #5

An environmental impact report (EIR) is required whenever substantial evidence in the record supports a "fair argument" that significant impacts may occur.

#### Response

EPA has determined that the requirements of the California Environmental Quality Act (CEQA), including the development of an EIR, are no more stringent than the requirements for environmental review under CERCLA, as amended by SARA. Therefore, an EIR is not required. Pursuant to the provisions of CERCLA, the NCP and other federal requirements, EPA's prescribed procedures for evaluation of environmental impacts, selecting remedial action with feasible mitigation measures, and providing for public review are designed to ensure that the proposed action provides for the short-term and long-term protection of the environment and public health, and hence perform the same function as, and are substantially parallel to the state's requirements under CEQA.

EPA will continue to cooperate with the State of California and appropriate Federal agencies during the design phase, to clarify further environmental review and mitigation requirements for this project and ensure that they are fulfilled.

#### Comment #6

The vertical and lateral extent of the TCE plume has not been defined. Nor is there any indication of the presence or extent of other contaminants beneath the Aerojet facility.

#### Response

EPA agrees that the extent of the TCE plume had not been fully defined in the EE/CA. Groundwater investigation and remediation is treated as an iterative process, requiring ongoing evaluation of system design, remediation time frames, and data collection. The removal action described in the EE/CA is intended as an interim measure to slow migration of the contaminant plume. This action is part of a larger Superfund response action for the contaminated groundwater at Aerojet.

However, in response to this and similar comments, EPA performed supplemental work to better define the plume. The results of this work was presented earlier in this document in the section entitled, "Summary of Additional Work." With the completion of this work, EPA believes that the estimations concerning the location of the groundwater contamination made in the EE/CA are accurate.

#### Comment #7

As a practical matter, one cannot know whether a remediation system will capture an entire plume without delimiting the vertical and lateral extent of the plume. Given this state of uncertainty over the Aerojet site, there is no assurance that the capture zones created by the proposed extraction wells will encompass the entire plume.

Moreover, there is also no assurance that the injection wells will establish an effective hydraulic barrier against further downgradient migration of the plume. Indeed, it may be that the extraction and injection activities will exacerbate the spread of the plume.

#### Response

Often the success of a groundwater remedial action is difficult to predict until the action has been initiated and operational data have been assessed. Because of the uncertainties in characterizing contaminated groundwater, actions often are selected on the basis of limited data. The differences between design and actual performance will be reconciled through periodic evaluation of the system.

However, in response to this and similar comments, EPA performed supplemental work to better define the plume. The results of this work were presented earlier in this document in the section entitled, "Summary of Additional Work." Based upon the data collected throughout the project, EPA continues to believe that the implementation of the action presented in the EE/CA is environmentally sound and will not serve to exacerbate the spread of the plume.

#### Comment #8

There is no question that the project will affect groundwater gradients in the area. The initial study discounts these effects as "very localized."

The EIR should also explore whether the proposed placement of the extraction and injection wells is the optimal configuration to contain and remediate contamination at the site.

#### Response

As presented in the "Summary of Additional Work," subsequent to receiving this comment EPA contracted for supplemental three dimensional modeling of the ARSA plume. In this exercise, EPA explored the placement of the extraction and recharge wells. As is presented in the modeling report, the placement of the wells presented in the EE/CA is believed to be environmentally sound, at this time. Also noted in this report is that EPA believes that additional wells will be needed to complete a remedial action for the ARSA.

#### Comment #9

The Initial Study Fails to indicate the quality of the water to be reinjected.

#### Response

This information is contained in the EE/CA in Table 4-1, Groundwater Treatment Design Assumptions. These values are a result of the analysis of the Applicable or Relevant and Appropriate Requirements (ARARs) discussed in Section 2 of the EE/CA.

#### Comment #10

The Initial Study fails to incorporate mitigation measures to address these impacts. For example, to ensure that the remediation program captures the existing plume, the installation of a network of monitoring wells should be proposed and a monitoring program should be adopted. In particular, wells should be installed to

provide an "early warning device" in the event the plume migrates further in the direction of the FOWD wells.

#### Response

EPA believes that the wells identified in the "Summary of Additional Work" as the Greenvale and Oak Glen wells will serve as "early warning devices" for the FOWD.

As further detailed in the EE/CA, Aerojet has installed wells in 38 locations (110 well completions) within the ARSA. These wells are sampled on a periodic basis. EPA believes that this constitutes an adequate network of monitoring wells at this time. Additional wells will be installed as needed in the ARSA in the future.

#### Comment #11

We question the initial study's conclusion that the project will not have an impact on air quality. We understand that the constituents of concern include TCE and other organic solvents.

There is no discussion of where the TCE and other organics will be volatilized in the course of treatment, and if so, the expected mass of chemicals that will volatilize. Similarly there is no discussion of where the Granulated Activated Carbon (GAC) will be recharged, and where the recharge process will result in ozone-precursor emissions.

#### Response

As explained in the EE/CA on page 23, the decision to use granular activated carbon (GAC) adsorption technology results in minimal contamination being released to the air. Additionally, the spent carbon is removed and shipped to an offsite commercial facility where it is thermally regenerated and recycled for reuse.

#### Comment #12

The project is built around two extraction wells and two recharge wells. The pumping wells lead to development of a capture zone which is supposed to encapsulate the contaminated water, while the recharge wells lead to development of a protection zone, which will preclude the flow of contaminated water toward the Fair Oaks wells. It is possible that water which is downstream of the recharge wells and which is considered clean is actually contaminated. Then, activation of the recharge wells will flush this water downstream at an accelerated rate, and that may lead to an early contamination of the Fair Oaks wells.



### Response

Based on the information presented in "The Summary of Additional Work," EPA believes that the removal action presented in the EE/CA will initiate action to protect the Fair Oaks water supply wells. Additionally, based upon the sample results from the new wells (at Greenvale Road and Oak Glen Way), EPA believes that the plume is sufficiently characterized to support implementation of the proposed action. Therefore, EPA does not believe that the implementation of this action as proposed in the EE/CA will flush the contaminated water downstream to the Fair Oaks water supply wells.

### Comment #13

The evaluation of the geometry of the capture zone assumes that each of the aquifers is of constant hydraulic conductivity. This, however, may not be the case, as has been observed in many aquifers. Inhomogeneities can appear in many ways, but one possibility, in particular in river valleys, is the existence of a buried river meander along the areas of induced gradients. This may lead to dissipation of the induced gradients, and to less than favorable development of the capture zone and protection zone. The possible impact will be the migration of TCE into zones which are assumed safe, and perhaps contamination of the Fair Oaks wells.

### Response

The modeling conducted for the EE/CA, as well as the supplemental modeling exercise, were not intended to rigorously match the existing hydrogeologic conditions, but to provide a consistent method to evaluate the capture zones created by the various proposed extraction alternatives.

While no groundwater model is ever a completely accurate representation of real world conditions, EPA believes that the three dimensional modeling approximates actual conditions of the ARSA and provides sufficient information to select a response action. EPA agrees that inhomogeneities are possible; however, modeling with this level of detail is not usual practice, nor is it warranted for this removal action, at this time.

### Comment #14

On purely theoretical grounds it can be shown that the contaminant plume's leading and trailing edges are the least reliable when it comes to estimation. In general, the lower the concentration the less reliable is its prediction. This situation is indeed reflected on Map 2-17, where question marks appear along the 5 ppb TCE concentration. In light of the above, Map 2-17 should not be viewed as the only possible representation of reality. In fact, the

actual plume can deviate a lot from the map and it can be spread over a much larger area. In order to establish further the creditability of the map, additional data is needed.

What impact does this have on the project? The pumping rates at the extraction wells determine the dimension of the capture zone as shown on Figure 4-8 probably reflect the dimensions of the plume as it is plotted on Map 2-17. If the plume is actually spread over a larger area, which may or may not be the case, it will not be entirely contained in the capture zone, and parts of it will continue to move downgradient, perhaps toward the Fair Oaks wells.

#### Response

EPA believes the data collected from the new wells on Oak Glen Way and Greenvale Road provides additional assurance of the substantial accuracy of the definition of the 5 ug/l plume line drawn on Map 2-17. Therefore, EPA does not believe that the plume is spread over a larger area and could be cut off by the extraction/recharge scenario.

Based upon post EE/CA modeling performed by CH2M Hill, EPA believes that the capture zone created is an environmentally sound initial step to capture the contaminated plume. As part of EPA's ongoing study of the ARSA, EPA will continue to evaluate the effectiveness of the extraction/recharge system.

#### Comment #15

For a gradient parallel to the river, the Chicago well and Town wells are barely inside the protection zone. A slight deviation in the above numbers will leave these wells outside the protection zone. For example: when the gradient is at 0.002, the dimension of the protection zone reduces by half, leaving the two wells completely unprotected in case that the plume upstream is not entirely encapsulated by the capture zone. Similar impact will occur if the gradient rotates toward the River, as may happen if there is a lowering of the water level in the River. Over the life span of the project, this may happen.

#### Response

This action is a removal action designed to expeditiously begin groundwater remediation before the contamination travels further in the groundwater system. As such, the effectiveness of the action will be monitored closely in order to determine if modification is necessary. Based on experience with existing pump and treat systems, early actions lead to faster and more efficient remediations. It is very common in the field of groundwater remediation that even the most thoroughly planned design, based on the most extensive data and complex modeling, will not always

affect the groundwater plume precisely as predicted.

As the system operates, performance data will be collected. After a reasonable period of operation, a report will be prepared that will evaluate the effectiveness of the operating system. Modifications to the system may be made over time.

Comment #16

If hydraulic connectivity is established between the upper aquifer and the American River, what will be the impact of the quality of the River water on the aquifer's water?

Response

This comment is somewhat unclear and is highly speculative. There is connectivity (or hydraulic conductivity) between the upper aquifer and the river. However, it is believed and assumed for modeling purposes that the conductivity will not change since it is based on physical characteristics of the geology between the river and the upper aquifer.

Comment #17

What steps will be taken to ensure that the aquifer will be declared clean with a large degree of confidence at the end of the project?

Response

The actions recommended in the EE/CA are scientifically sound and environmentally prudent based upon the existing data. The proposed initial system is expected to provide beneficial interim control of chemical migration, and is believed to be consistent with long-term remedial goals.

As part of the ongoing Superfund investigation at Aerojet, the American River Study Area will be periodically monitored and evaluated for effectiveness. Based upon the actual performance of the system, EPA will determine what future action is necessary to protect public health and the environment. EPA will determine clean up levels for the aquifer during the implementation of the remedial process to be memorialized in a Record of Decision (ROD). The ROD will address the issue of achieving final clean up of the aquifer in more detail. The actions recommended in the EE/CA will provide an early start on achieving these goals.

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**Carmichael Water District (8/17/94)**

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Comment #18

The proposed project is likely to increase the long term risk that trichloroethylene (TCE) and other contaminants will eventually enter Carmichael Water District's aquifer and reach [Carmichael] wells. The proposed reinjection program is likely to increase the risk that two Fair Oaks Water District Wells, Well No. 1 and the Chicago Well, will be contaminated by TCE. Carmichael Water District's wells are downstream of the Fair Oaks Water District Wells.

Response

As discussed in the Summary of Additional Work, two new wells have been installed to define the leading edge of the plume, aquifer pump tests have been performed in the vicinity of the extraction wells, and supplemental modeling has been performed. Based upon the most recent information EPA has, EPA does not believe that the placement of the recharge wells as proposed in the EE/CA is likely to increase the risk of contamination to the Fair Oaks and Carmichael water supply wells. On the contrary, EPA believes that the implementation of this action will protect these wells from the otherwise inevitable migration of the contaminant plume to these water supply wells.

Comment #19

The Engineering Evaluation/Cost Analysis (EE/CA) does not locate the leading edge of the TCE plume.

Response

See Response to Comment 6.

Comment #20

The document does not correctly interpret the 20-year flow line model results shown in Figure 4-8 in the EE/CA report. Correct interpretations would indicate that the proposed recharge wells are likely to force a portion of the TCE plume to move toward Fair Oaks water district wells at an accelerated rate of flow and eventually to reach Carmichael Water District Wells.

Response

The modeling performed in the EE/CA was not intended to rigorously match the existing hydrogeologic conditions, but to provide a

consistent method to evaluate the capture zones created by the various proposed extraction alternative.

When Figure 4-8 was created for the EE/CA report, the complete flow lines were not included in the report. To respond to this comment, Aerojet provided a new Figure 4-8 to Carmichael Water District which extends the flow lines as produced by the model. This figure is included in the Administrative Record. EPA does not interpret these flow lines to necessarily indicate that a portion of the plume will be accelerated toward the Fair Oaks and Carmichael water supply wells. Nevertheless, supplemental modeling has been performed which addresses this issue. The results of the supplemental modeling are described in EPA's Response to Comment 7 and in "The Summary of Additional Work."

#### Comment #21

It appears that the reinjection wells are inappropriately sited. If it is not possible to properly site the reinjection wells, then an alternative disposal method should be employed.

#### Response

The location of the recharge wells has been moved to approximately 500 feet northwest of the originally proposed locations. EPA believes that they are appropriately sited based upon the additional monitoring well data collected at the Oak Glen Way and Greenvale Road locations and the supplemental monitoring performed since the finalization of the EE/CA.

EPA does not believe that an alternative disposal method is needed at this time. Based upon the most recent data, EPA believes that the reinjection of the treated water into the aquifer is the best disposal alternative at this time.

#### Comment #22

The following actions would resolve our concerns regarding this matter:

Locate the approximate leading edge of the plume by drilling additional monitoring wells in the direction of travel of the plume.

Reposition the reinjection wells downstream of the leading edge of the plume to form a barrier to further northwestward migration of the plume, or preferable, locate an alternative disposal option for the treated water, such as the Sacramento Regional Sanitation District's Sewer Lines; discharge directly to the American River; indirect discharge to the river via the Nimbus Fish Hatchery; landscape irrigation in Ancil Hoffman Park just downstream or in

local agencies are willing to accept the treated water. If an alternative to recharge wells is adopted, additional extraction wells closer to the leading edge of the plume may be necessary to preclude further plume movement.

Construct monitoring wells north and west of the reinjection wells to monitor the hydraulic and quality effects of the reinjection, or if alternative disposal methods are selected, monitoring the leading edge of the plume to evaluate the effectiveness of extraction wells.

Provide appropriate advance notice to and coordination with the Carmichael and Fair Oaks Water Districts on progress in this removal action.

#### Response

Actions taken to respond to this comment are summarized in the earlier section entitled, "Summary of Additional Work." EPA believes that all of these concerns have been addressed by the following three actions:

- 1) The installation of the Oak Glen Way and Greenvale Road monitoring well;
- 2) the performance of pump tests on wells in Sailor Bar Park; and
- 3) the development of a three-dimensional model for the ARSA.

The supporting documentation for these actions can be found in the Administrative Record.

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**Miscellaneous Public Comments (various dates)**

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Comment #23

Mr. Edward Chalpin in a letter dated September 3, 1993, commented that the contamination may not be solely attributed by Aerojet since in the 1950's and 1960's an auto dismantling company actively spilled chemicals in the area of Sunrise Boulevard, north of Coloma Road.

Response

EPA believes that the contaminant plume to be addressed by the removal action in the American River Study Area is directly related to the activities on the Aerojet property. Based upon the historical groundwater flow and disposal activities, the source of the contamination can be attributed to a release from Aerojet.

The Area identified by Mr. Chalpin, on Sunrise Boulevard, is not under investigation by EPA at this time.

Comment #24

Douglas F. Schwilk, M.D. in a letter dated September 13, 1993 commented that the treatment plant should not be located in Sailor Bar Park. Construction noises throughout the summer have been disruptive to the residents nearby.

Response

EPA sent a letter to Dr. Schwilk on September 21, 1993 requesting clarification of his concerns and requesting that if construction continues to be a nuisance that he contact EPA.

EPA acknowledges this concern. However, there are practical limitations for the location of the initial extraction wells due to the presence of the residential neighborhoods adjacent to Sailor Bar Park. Sailor Bar Park is the best possible location identified by EPA to place the treatment plant when considering the hydrogeologic needs and the land constraint of neighborhoods. As stated earlier, the treatment plant and associated piping will be built in a manner to preserve the natural state of the park to the extent possible. Construction disruption will also be minimized and EPA has requested that residents report disturbances so that they may be addressed promptly.

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**Carmichael Water District (9/16/93)**

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Comment #25

The report lacks a clear description of the plant, the construction methods to be used for the wells, pipelines and plant; does not address institutional constraints, such as the American River Parkway, federal and state wild and scenic rivers regulations; and lacks description of impacts on visual resources, recreational facilities, noise levels, light intrusion, vegetation, wildlife, energy resources, air quality, and other factors.

Response

The decision to implement this action will be followed by the development of specific design information which will also be subject to EPA approval and will be included in the public record. The EE/CA addresses all federal and state applicable or relevant and appropriate requirements.

EPA will continue to coordinate with the State of California and appropriate Federal agencies during the design phase, to clarify further environmental requirements for this project and to ensure that they are fulfilled.

Comment #26

The groundwater to be extracted contains substances classified as unknowns in Appendix E of the document. If the groundwater will be discharged to the American River any way, reinjected or left in the groundwater, Carmichael Water District would like to be informed in writing of the actual identity of these "unknown" substances.

Response

Finding unknown compounds during an analysis of groundwater is not uncommon. In accordance with applicable EPA guidelines, the groundwater was analyzed by usual EPA Methods 624, 625, 601 and 602. Most hazardous chemicals will be identified when these analytical methods are performed. In efforts at further contaminant identification, the unknown compounds that were found were compared to the library of known chemicals. Only three were able to be identified in this process: 1,4-dioxane, n-butylbenzene-sulfonamide and 1-methyl-2-pyrrolidinone. The remaining unknowns are not quantifiable at this time, without the use of unjustified, uncommon methods.

Most unknown compounds in groundwater are either fragments of substances or their degradation products. Since the groundwater at Aerojet was analyzed for the commonly occurring hazardous



compounds, EPA believes that the unknowns shown in Appendix E are most likely non-hazardous.

Comment #27

No computations are presented in the EE/CA to document the volume of water within the aquifers affected by the plume north of the river, what amount of extraction in volumetric terms that would have to occur, and the pumping rate and durations required to effect removal of the contaminants (sic). Such computations appear possible from the characterization of the aquifers in the EE/CA and should be included. The proposed extraction rates should be related to these requested calculations.

Response

The action is considered an interim step in EPA's response to the contamination migrating from Aerojet. As such, the estimation of the volume of water to ultimately be treated at the ARSA is premature.

Comment #28

The flow lines plotted for the two-dimensional model results (Figure 4-8 and supplemental plats provided by Aerojet staff) are approximate, as illustrated when a reader compares the direction of those flow lines to the groundwater contours in Figure 2-11. The fact that the flow lines are perpendicular to the groundwater contours illustrates these approximations.

Response

This comment is unclear because by definition flow lines are perpendicular to contour lines. However, the supplemental modeling exercise performed subsequent to this comment may help to clarify this issue.

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Remy and Thomas, on behalf of the Fair Oaks Water District  
(9/20/93)  
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Comment #29

The analysis is mostly qualitative, and it is not shown that the numerical model which is constructed can indeed explain all the data. As a result, most of the analyses which are based on the model are questionable.

Response

The intent of the EE/CA was not to provide a complete characterization of the ARSA, but rather to evaluate all existing data and provide recommendations for interim control measures which could be rapidly implemented to control further downgradient migration of the defined plume present in the groundwater.

As stated in the EE/CA, the two-dimensional numerical modeling was used as a simple tool to help evaluate various interim remedial measures, and was not intended to "explain all the data." At the time of scoping of the EE/CA, EPA believed that this level of effort for groundwater modeling was sufficient.

Since the finalization of the EE/CA, a three-dimensional model has been constructed for the ARSA. The results are included in the Administrative Record and presented in the "Summary of Additional Work."

Comment #30

The continuity of the aquitards is a conjecture and this conjecture is important since some of the chemicals in the groundwater can be classified as DNAPL (Dense Nonaqueous Phase Liquids) and may move vertically under the influence of gravity. The conjecture of aquitard continuity may lead to a conclusion that vertical spreading between aquifers is limited or non-existent, and that the presence of contaminants in all three aquifers indicates that this conjecture is not in agreement with observations.

Response

The EE/CA did not conclude that the aquifers were isolated by aquitards. Rather, the EE/CA's use of the term "aquitard" was consistent with commonly used definition. An aquitard can be considered to be 1) less permeable beds in a stratigraphic sequence, 2) permeable enough to transmit water in quantities that are significant in the study of regional groundwater flow, or 3) a layer of low permeability that can store ground water and also transmit it slowly from one aquifer to another. Leakage in fact

appears to occur between the aquifers, through the aquitards, as evidenced by drawdown observed in all three aquifers during the pumping of the lower aquifer (Well 1224 pumping test at the Fish Hatchery).

In addition, that some of the chemicals present are classified as DNAPLs does not mean that they necessarily exist in their liquid state within the study area. There is no evidence that free phase DNAPLs are present in the EE/CA study area.

When non-aqueous phase liquids are present, they are generally found near the source of a chemical spill due to their limited mobility in the subsurface. The source of the chemicals in the ARSA is suspected to be no more than 1 mile upgradient from the center of the plume on the Aerojet facility.

#### Comment #31

There is an indication of heterogeneity of the hydraulic conductivity. However, the numerical model reported in Appendix I assumes a constant value for the hydraulic conductivity. This suggests that the choice of value for that parameter based on a single pumping test is quite arbitrary, and as a consequence, the geometry of the capture zones as obtained from the numerical simulations is also arbitrary. The heterogeneity may manifest itself as a buried ancient river meander which may lead to failure of the remediation project.

#### Response

As stated above, numerical modeling was used in the EE/CA as a preliminary tool to help evaluate various interim response measures. This simple model was chosen because a small amount of data could provide some evaluation of the removal alternatives. Nevertheless, the hydraulic conductivity values were not selected at random or without reason and, therefore, are not arbitrary. Rather, the values were based on the only complete pumping test available in the study area (lower aquifer on the Southeastern side of the river) and on the lithologic descriptions of the upper, middle, and lower aquifers (silty sands, sands, and gravels).

More comprehensive modeling of the area was conducted after additional pumping tests were completed on the first three test wells on the north side of the park. This information is summarized in the "Summary of Additional Work" and is included in the Administrative Record.

#### Comment #32

Natural recharge should be incorporated in the numerical model.

### Response

The removal action presented in the EE/CA is intended to be an initial action for the ARSA. As such, the modeling effort is only intended to simulate the relative response of a real world system. In future modeling exercises, which will have the benefit of real world data of the aquifer reaction to the implementation of this action, EPA may consider the inclusion of natural recharge into the numerical model.

### Comment #33

Inspection of the head data shows that it can be interpreted in many ways. Maps can be constructed with gradients pointing in directions other than those presented in the EE/CA. Maps from a 1964 Department of Water Resources (DWR) bulletin are cited that show head contours for Spring 1946 and Spring 1953. Gradients other than the one suggested in the EE/CA are likely.

### Response

Contouring of water levels and other spatially distributed data can be somewhat subjective and open to interpretation. In order to provide consistency to the process of contouring water levels, a computer contouring program, Surfer, was used to prepare the potentiometric maps presented in the EE/CA. This program uses the Kriging algorithm to calculate a regularly-spaced grid of water levels based on the irregularly-spaced data. The contouring program then uses this calculated grid to generate a contour map. This demonstrated approach provides for a rapid and consistent evaluation of numerous data sets. The resulting maps are generally representative of the surface being contoured, especially where the density of data is the highest. Where data is sparse, as in the northeast, southeast, and southwest corners of the study area, the resultant contours can be irregular or otherwise appear "incorrect" to someone unfamiliar with the computer contouring program or the study area.

As shown by the potentiometric maps presented in the EE/CA (Figures 2-10, 2-11, and 2-12), the direction of groundwater flow for the three aquifers ranges between N60W and N75W within the central portion of the chemical plume. This interpretation of groundwater flow direction is supported by the following facts: 1) relatively consistent directions of groundwater flow in the three aquifers; 2) relatively constant direction of flow based on data collected in recent years; and 3) the axis of the chemical plume is elongated in a west-northwesterly direction (approximately N65W), parallel to the interpreted direction of groundwater flow.

Contrary to the commenter's statement, the 1964 DWR report is also consistent with this interpretation, as discussed below. Comparing

the potentiometric maps presented in the EE/CA with the potentiometric maps presented in the 1964 DWR report is somewhat tenuous. The EE/CA maps cover an area of approximately 3 square miles. Within the EE/CA study area, at the time the report was submitted, there were 39 Aerojet well locations with 104 individual completions, of which 68 (of the completions) were suitable for contouring water levels.

There are 24 groundwater well locations identified in the DWR report in and around the EE/CA study area. Nine of these have completion dates listed in Table 5 of the DWR report and only 2 of these 9 wells were completed prior to 1946. The fewer the data points available, the less reliable is a resulting contour map. The DWR maps cover an area greater than 120 square miles with only 7 wells within the EE/CA study area and another 17 wells within approximately one mile of the EE/CA study area. In addition, the water level data used for the DWR maps are between 30 and 47 years old.

Figure 5 of the DWR report is cited as "factual support" that a different interpretation of the groundwater flow direction is possible. Figure 5 shows potentiometric contours for Spring 1946 and Spring 1953. The commenter states that one gradient is parallel to the river and another is almost perpendicular to it. This statement is difficult to interpret because the river meanders through the EE/CA study area, changing direction several times. The contours on DWR Figure 5 indicate directions of flow of N29W and N60W for 1946 and 1953, respectively, within the EE/CA study area. DWR Figure 6 is not cited which presents potentiometric contours for Spring 1962 and Spring 1963. These more recent contours indicate a direction of groundwater flow of N60W and N66W, respectively. The directions of flow based on DWR maps for 1953, 1962, and 1963 indicate a consistent groundwater flow direction between N60W and N66W over a 10-year period. These values are in good agreement with the groundwater flow directions presented in the EE/CA, especially given the difference in scale and data density (number of wells available to contour) between the EE/CA and the DWR report. The 1946 groundwater flow direction in the DWR maps is significantly different from that shown during subsequent years and may result from fewer wells being present than in subsequent years.

#### Comment #34

Time dependence of hydraulic heads, and hence variability in the head gradient, are the rule rather than the exception, and need to be accommodated in the project design. Larger gradients lead to smaller capture zones (Todd, 1980) and hence to less than full coverage of contaminants.

## Response

Source sites on Aerojet's facility (identified as "Zone 1" in the Aerojet Superfund RI/FS program) were identified as potential locations where DNAPLs or VOCs dissolved in water may have seeped into the ground. These sites have been investigated via soil and soil vapor sampling during the on-going remedial investigation and feasibility study (RI/FS). The commenter's comments may be relevant to the source sites within the Aerojet site, but are not applicable to the soils within the EE/CA study area because Aerojet source sites are not present within the study area.

## Comment #38

The commenter discusses chemical retardation factors and their implication for the distribution of chemicals in groundwater. He states, based on the work of others, that "...the retardation factor for PCE is around 4.0, for DCE it is around 1.74 while for vinyl chloride it is around 1.0." He then states that vinyl chloride may have migrated faster than TCE and may be located downstream, closer to the Fair Oaks wells, and suggests that a larger area needs to be surveyed to determine the extent of the contamination problem. He further states that the duration of pumping which may be sufficient to extract the TCE may not be sufficient to extract chemicals with higher retardation factors.

## Response

In general, chemical retardation factors in groundwater flow systems are difficult to quantify. They are dependent on many variables including the physical characteristics of the aquifer, the total organic carbon content of the aquifer materials, and interactions between the chemicals and the aquifer materials. A retardation factor of 2.0 was used for the numerical modeling because this value is considered applicable for TCE. Because TCE is present at the highest concentrations and is the most widespread VOC in the groundwater of the study area, TCE represents the greatest potential threat to nearby water supply wells. Furthermore, the TCE plume encompasses the plumes for the other VOCs presented in Appendix F (Figures F-1 through F-12) of the EE/CA. A retardation factor for TCE was incorporated into the modeling to present a more conservative estimate of the upgradient extent of the capture zone for a given period of pumping.

The conjecture that vinyl chloride may have migrated farther downgradient ahead of the TCE plume is not supported by the data. There are 97 wells (monitoring, water supply) in the ARSA that have had detectable VOCs since the first samples were collected in the early 1980's. Only three of these wells have ever had detectable concentrations of vinyl chloride. Of these three, two wells had detectable vinyl chloride in one sample out of at least 18 samples

### Response

The statement regarding the variability of gradients and their effect on the size of capture zones is incomplete. The configuration and size of a capture zone created by one or more extraction wells is the result of an aquifer's physical characteristics (thickness and hydraulic conductivity), the magnitude of the groundwater gradient, and the pumping rate of the extraction wells. Given an aquifer with unchanging physical characteristics, an increase in gradient must be accompanied by an associated increase in groundwater flow velocity. An increase in groundwater velocity would allow for a higher pumping rate which would maintain the size of the capture zone. Should significant changes in the natural gradient occur over time, flow rates of the extraction wells can be adjusted to maintain the capture zone of the system.

### Comment #35

The water level fluctuations support the previous issue regarding interpretation of groundwater flow directions. Hunt, et al (1988, p. 1248) observe that '...the zone contaminated by a lighter-than-water liquid will extend over the entire range of water table fluctuations...' Such a liquid (referred to as NAPL or LNAPL, i.e., Light Nonaqueous Phase Liquids) for example is DCE, which was detected in the study area. The commenter continues "...large amounts of LNAPL (Light Nonaqueous Phase Liquids) may exist in the vadose zone above the water table, and will continue to release contaminated material into the water with every fluctuation of the water table. He goes on to state that the vadose zone needs to be sampled, and an appropriate remediation scheme needs to be devised and implemented.

### Response

The occurrence of water level fluctuations does not necessarily lead to changes in the direction and magnitude of the gradient. Water levels can fluctuate daily due to atmospheric conditions and seasonally due to climatic conditions. They can also change over long periods of time due to change in the water balance caused by varying patterns of inflow and/or outflow to the groundwater system, such as extended periods of lower-than-normal or higher-than normal rainfall. However, these large-scale factors tend to affect the groundwater system as a whole: water levels go up or down throughout the system without an appreciable change in the direction of flow and magnitude of the gradients. Some major change in the driving force of the groundwater gradient must occur for there to be a significant shift in the direction of groundwater flow.

The argument for the presence of LNAPLs on the water table or within the vadose zone of the American River Study Area has no factual or technical basis. As discussed below, dissolved LNAPLs have not been identified in any of the groundwater samples from the study area, including gasoline, diesel, benzene, toluene, xylenes, and other non-chlorinated volatile organic compounds (VOCs).

The commenter claims that DCE is an LNAPL, and that liquid DCE was detected in the study area. He does not state which form of DCE he is referring to. However, both 1,1-DCE and 1,2-DCE, which have been identified in the study area, have a specific gravity (density relative to water) between 1.2 and 1.3 indicating they are heavier than water. Therefore, these chemicals are not commonly considered LNAPLs. Furthermore, of the fifteen VOCs that have been identified in the study area regularly (more than twice) since 1983, all are heavier than water. Therefore, there is no evidence to support the commenter's claim that LNAPLs exist in a dissolved state, let alone a free liquid state in the study area. There is no data that suggests the presence of free phase chemicals in the ARSA.

Contrary to the commenter's statement, the vadose zone was sampled in the ARSA in 1991 as part of an earlier investigation. Soil vapor samples were collected at 11 locations throughout the ARSA, including the vadose zone overlying the portion of the plume with the highest VOC concentrations. Except for low TCE concentrations (4 and 8 ppb in soil vapor) at two locations, no other VOC was identified in the vadose zone above laboratory detection limits, including 8 non-chlorinated VOCs. These results are summarized on Page 12 and Figure 2-35 of the EE/CA and the laboratory reports are included at the end of Appendix H of the EE/CA. EPA does not believe that remediation is required in the vadose zone based on this data.

#### Comment #36

"The VOCs identified are both DNAPLs and LNAPLs...I did not find any record suggesting that some action was taken to detect LNAPL's (sic) above the water table."

#### Response

See Response to Comment #35.

#### Comment #37

The commenter cites work done by others regarding the presence of DNAPLs based on soil concentration data and states that "...a comprehensive soil sampling campaign was not taken to parallel water sampling, and hence it is possible that large quantities of DNAPL have passed undetected, and furthermore, that they exist in areas which are currently considered to be clean."



containing VOCs, and the third well had detectable vinyl chloride in three out of 54 samples containing VOCs. If vinyl chloride was indeed downgradient, it would have been detected consistently in downgradient wells.

#### Comment #39

Contaminants other than VOC's, e.g., inorganics, were detected in concentrations close to or at the limits set by the California Dept. of Health Services (e.g., Chromium). The commenter continues by stating that the maximum concentrations observed (as presented in Table 2-1 of the EE/CA) need not be equal to the maximum existing concentrations, but "...should rather be viewed as samples drawn at random from a statistical population. The immediate implication is that a substantive analysis is needed before a chemical is determined to be safely below the regulatory limits."

#### Response

The inorganic chemicals that were detected at concentrations at or above the California Department of Health Services' primary maximum contaminant levels (MCLs) were aluminum (detected at 3.6 mg/l, MCL is 1 mg/l) and chromium (detected at the MCL of 0.05 mg/l). As stated in the footnotes on Table 2-1 of the EE/CA, elevated metals concentrations may be the result of analyzing unfiltered groundwater samples. This appears to be the case at the ARSA.

As part of the RI/FS (Aerojet Stage 1A Report, February 1993), both filtered and unfiltered groundwater samples were collected from 20 onsite wells. Metal concentrations above MCLs were detected in 13 of the 20 unfiltered samples. Metal concentrations above MCLs were not detected in any of the filtered samples. Aluminum concentrations in the unfiltered samples were up to 330 u/l and chromium concentrations were up to 0.85 mg/l. In the filtered samples, the highest aluminum concentration was 0.17 mg/l and chromium was not detected. These data strongly indicate that the metals detected in the unfiltered EE/CA groundwater samples are the result of suspended sediments in the samples. Therefore, these results are not indicative of the metal concentrations that are dissolved in the groundwater.

#### Comment #40

The commenter discusses the difficulty of mapping chemical plumes due to "...the spatial variability of the hydraulic and chemical parameters." He then states that "...mapping a contaminant plume's leading and trailing edges (the low concentrations) is the least reliable..." and "...the exact total contaminant mass is probably unknown and extra caution is needed." The commenter suggests that in order to address the contaminant mass a stochastic approach can

be adopted "...to quantify and account for the uncertainty involved in an estimation. Another way is to increase the area sampled as well as the number and frequency of samples taken." Finally, he states that "...considering the concentration's contour maps as a deterministic reality will lead to inaccurate interpretations and decisions."

#### Response

It is well understood that mapping chemical plumes can be a difficult task. Uncertainty is an accepted characteristic of the science of hydrogeology. Therefore, interpretation of limited data is often necessary prior to making decisions relative to controlling and selecting responses to a real-world groundwater problem. The process of defining the problem and reaching a final solution must be iterative. Progress is made by evaluating available data, making recommendations to gather additional data based on current knowledge, and further evaluation of the problem as the new data becomes available.

Early in a study such as this, the unknown is the driving factor for the project, which requires the installation and sampling of a series of monitoring wells to characterize the composition and distribution of the chemical plume(s). This project has accomplished this initial task and is now at the stage where what is known is much more significant to decision-making than what is unknown.

The actions recommended in the EE/CA are scientifically sound and environmentally prudent based on the existing data. The recommended actions will provide additional data with which to further characterize the groundwater flow system and provide additional recommendations for a final remediation system. Even if additional control measures are determined to be necessary, the proposed initial system will provide beneficial interim control of chemical migration.

At this point, determining the total mass of chemicals in the aquifers would be an academic exercise of little or no consequence. Adopting a stochastic approach and/or increasing the number and frequency of samples taken will only delay implementation of the planned removal action.

#### Comment #41

The commenter states that "...heterogeneity and its impact on the project needs to be addressed through a series of pumping and tracer tests at many different locations in the aquifer... A single large scale pumping test is not sufficient to characterize the site properly."

### Response

The EE/CA did not state that the single pumping test of Well 1224 was sufficient to fully characterize the site. However, that test did provide valuable data for the conceptual model which led to the recommendations for the removal action.

It must be emphasized that the plumes identified in the EE/CA represent a potential threat to public water supply wells. This project must be implemented to prevent further migration. A series of pumping and tracer tests would be an academic exercise that might provide additional data, but would be very time-consuming and certainly would delay the project.

However, in response to these and similar comments, additional pumping tests were performed in the ARSA. The results of these tests are discussed in the "Summary of Additional Work" and are included in the Administrative Record.

### Comment #42

The commenter states that the pumping test described in the EE/CA was analyzed using methods based on a theoretical approach which assumes homogeneous aquifers, and that this may not be the case for the ARSA. He then states that such a conflict will lead to inaccurate and arbitrary interpretations.

### Response

The pumping test described in the EE/CA was analyzed using methods developed by Theim in 1906 as modified by Theis in 1935 and Hantush in 1956. These methods, even though they do indeed assume homogeneous aquifers, are generally accepted practices and have proven to be sound and appropriate over several decades of practical application.

### Comment #43

The commenter states that a different way of analyzing a pumping test is by calibration of a numerical model.

### Response

This comment is not clear as to how model calibration can be used to analyze a pumping test. Model calibration usually involves the refinement of model hydraulic conductivity and recharge values and other parameters so that model water levels attempt to match actual water levels. Usually, a credible model is based on the results of the pumping tests, and is not an analysis of the pumping tests. The EE/CA utilized standard, well-documented methods to analyze the pumping test data and then utilized those results in the model.

Future pumping tests will be conducted as part of the ongoing response action that may better respond to this comment.

Comment #44

An explanation for the drawdown on Figure 2-27 24 hours prior to the start of the constant rate test was not found.

Response

The drawdown in question was caused by a step-drawdown test performed prior to the constant rate test. The step drawdown test is described on Page 9 of the EE/CA and the data is presented in Figure 2-25.

Comment #45

In summary the commenter states that the number of tests is insufficient, the analysis is incomplete, and inappropriate for decision making and detailed design.

Response

The EE/CA pumping test analysis was based on generally accepted practices of the profession of hydrogeology and provided hydraulic conductivity values that were consistent with published values for similar materials. These results were appropriate for the recommendation to install an initial set of three extraction wells (one well per aquifer) on readily accessible public land at the northernmost extent of the plume.

An iterative approach to this response action will provide for a timely and cost-effective implementation of the complete remedial system. Since the date that this comment was made, additional pumping tests have been conducted with additional modeling and analysis.

Comment #46

The commenter states that the numerical model is used to predict the response of the aquifer to different response alternatives and it should therefore be viewed as a replicate of reality. He also states that any error in the model will lead to misrepresentation of reality and to erroneous design.

Response

A numerical model can never be a replicate of reality because a model must simplify the inherent complexities of groundwater flow in order for the model to function in a timely and cost-effective manner. At best, a model can be viewed as an approximation of

reality, and therefore the results should always be viewed with a certain degree of skepticism. For design of interim response, a model is used as a tool for analysis and does not represent the end product of the study.

Comment #47

The commenter states that although the EE/CA indicates the computer model is not rigorous, the report contains a detailed design of the recommended removal alternative which is based on the model.

Response

It is not clear what the commenter considers to be a detailed design. The removal alternative recommended in the EE/CA should be considered a conceptual design since it represents the initiation of interim removal measures that will both control chemical migration and provide valuable data for detailed design of the final remediation system.

Comment #48a

The commenter claims that the numerical model in the EE/CA is "...not suitable for modeling this contamination problem for the following reasons:

- The model cannot handle multiphase flow problems and hence several important effects cannot be modeled;
- Gravity effects are important when dealing with DNAPL...but since the model is two-dimensional, the effects of gravity cannot be modeled."

Response

It is inferred from this statement that the commenter is referring to the conjectured presence of pure phase DNAPLs and/or LNAPLs in the groundwater. As stated in EPA's response to Comment 35, there is no evidence that pure phase NAPLs are present in the study area. In fact, there is substantial evidence to the contrary.

Comment #48b

- Each of the three aquifers is modeled separately. Hence, additional important effects cannot be modeled.

Response

In response to this and similar comments, three-dimensional modeling was performed as a supplement to the EE/CA. It is described in the "Summary of Additional Work" and the report is

included in the Administrative Record.

Comment #48c

- The model assumes a head gradient which is parallel to the river. Such an assumption is not valid (DWR 1964) and may be harmful since any change in the gradients will affect significantly the geometry and orientation of the capture zones.

Response

As discussed previously in EPA's response to comment #33, the 1964 DWR report supports the direction of groundwater flow as presented in the EE/CA.

Comment #48d

- The model was not calibrated to account for and explain all observed data.

Response

As stated in the EE/CA, the model was not intended to rigorously match the existing hydrogeologic conditions, but to provide a consistent method to evaluate the capture zones created by the various proposed extraction alternatives.

Comment #48e

- The model assumes constant conductivity and no attempt was made to model the natural heterogeneity of the hydraulic conductivity.

Response

See response to comment #31. In response to this and similar comments, more sophisticated and comprehensive three-dimensional modeling was performed to evaluate the performance of the system. The results are described in the "Summary of Additional Work" and are included in the Administrative Record.

Comment #48f

- The model does not account for natural and artificial recharge.

Response

See response to comment 32.

Comment #48g

- In summary, all these deficiencies may lead to gross inaccuracies in estimating the capture zones and the efficiency of the contaminant removal, and hence to errors in evaluating the feasibility of the remediation project.

Response

The model in the EE/CA was not used to evaluate the feasibility of a remediation project. It was used as a preliminary screening tool to help select locations for initial groundwater extraction wells that will provide interim removal and additional data to further evaluate what is necessary to install and refine the complete remedial system. In addition, supplemental three-dimensional modeling was performed for the ARSA and is included in the Administrative Record.

Comment #49

The commenter questions the objective of the removal action to be the treatment and control of VOCs. He states that Table 2-1 of the EE/CA shows some non-VOCs at concentrations which are close to or above regulatory limits.

Response

The non-VOCs referred to are aluminum and chromium. As stated in EPA's response to comment 39, the presence of these metals in groundwater samples is believed to be due to the fact that the samples were not filtered prior to laboratory analysis.

Comment #50

The commenter questions a statement from the EE/CA that there is no present need for point of use treatment and it is very likely that chemicals have migrated further than anticipated in the EE/CA. The commenter states that more tests and analyses are needed before this statement is accepted.

Response

In order to address this comment, two new wells have been drilled and sampled in Fair Oaks (see Summary of Additional Work). Based upon this information, EPA does not believe that the contaminant plume has significantly changed from that which was presented in the EE/CA. However, based upon recent sample collection rounds of data (collected in November 1993), new plume maps have been drawn and included in the Administrative Record.

Additionally, the Parties to the Consent Decree (Aerojet, the DTSC, the RWQCB, and the EPA) intend to add the Fair Oaks Town and Chicago Wells to the list of water supply wells which are routinely sampled under Exhibit IV of the Partial Consent Decree. If chemicals are detected in Fair Oak's water supply wells, then Aerojet will be required to evaluate alternatives, (including point of use treatment) for addressing the contamination.

Comment #51

The commenter states that he "would like to discuss some design criteria which needs to be evaluated..." and that "It is not clear how pumping duration was determined...It should be recalled that some VOC's (sic) are retarded more than TCE and hence take longer time to travel to the pumping wells."

Response

The 20-year duration of pumping modeled in the EE/CA was chosen somewhat arbitrarily to give some perspective to the length of time involved in a pump-and-treat remediation system. The actual duration of pumping will not be based on theory or academic studies, but on real-world data collected from monitoring wells throughout the life of the project.

Comment #52

The commenter cites studies that suggest that constant pumping is less favorable than cyclic pumping, and that this will affect pumping duration.

Response

In a situation where the primary contaminant may be a free-phase liquid that floats on the surface of an unconfined aquifer, such as gasoline, cyclic pumping may be appropriate. However, when the chemicals of concern are dissolved in the groundwater and their driving force for migration is groundwater flow (such is the case in the American River study area), the purpose of constant pumping is to modify the groundwater gradient in such a way that the groundwater containing the chemicals is directed to extraction wells for removal and treatment. Furthermore, it is important to maintain the modified gradient, so that contaminated groundwater continues to flow toward the extraction wells.

Comment #53

The commenter cites studies that conventional pump-and-treat remediation has not been effective in remediating contamination by immiscible contaminants (DNAPLs and LNAPLs).



### Response

As EPA's response to Comment #35 states, the presence of DNAPLs and/or LNAPLs is not supported by the existing data.

### Comment #54

In conclusion, the commenter states that the numerous concerns and questions raised in his letter "...need to be addressed and answered satisfactorily before it can be said that the Fair Oaks wells and water supply are safe again."

### Response

It is emphasized that the purpose of this removal action is to protect the Fair Oaks public water supply wells which are downgradient of the groundwater contamination described in the EE/CA.

EPA believes that the implementation of this removal action, and the continued ongoing study of the ARSA in accordance with the CERCLA process is an environmentally sound approach to protection of public health and the environment.

## Miscellaneous Oral Comments Received During the Public Comment Period

### Comment #55

Two local residents wanted additional information on the depth of the contamination and the potential health effects on humans as well as animals.

### Response

Additional information was provided orally on the extent of contamination, as it is presented in the EE/CA. A health effects fact sheet produced by the Agency for Toxic Substances Disease Registry (ATSDR) on TCE was also provided.

### Comment #56

A representative of the Sacramento Valley Toxics Campaign (SVTC) expressed concern that the insurance companies may pay the clean up costs at Aerojet. The SVTC would prefer that Aerojet pay the entire amount of the clean up costs.

### Response

EPA has identified Aerojet General and its subsidiary, the Cordova Chemical Company, as the Potentially Responsible Party (PRP) for the Aerojet Superfund Site. As such, EPA considers these parties to be responsible for the clean up costs incurred. EPA typically is not involved in negotiations or other transactions between parties and their private insurance companies, and has no information on Aerojet's relationship with its insurers.

Appendix B

## Appendix B

### **Discharge Limitations**

Aerojet will not discharge water with concentrations of chemicals in excess of the following limits:

<u>Chemical</u>	<u>Monthly Average</u>	<u>24hr Maximum</u>
Trichloroethylene	0.5	1.0
Tetratrachloroethylene	0.5	1.0
1,1,1-Trichloroethane	0.5	1.0
Trichlorotrifluroethane	0.5	1.0
1,1-Dichloroethylene	0.5	1.0
Trans,-1,2-Dichloroethane	0.5	1.0
1,2-Dichloroethane	0.25	0.5
Chloroform	0.5	1.0
Vinyl Chloride	0.25	0.5
N-Nitrodimethylamine	0.015	0.015
Freon-113	1.0	2.0
Carbon Tetrachloride	0.25	0.5
1,4-dioxane	2.5	15
Sulfonamide	10	20
Pyrrolidinone	10	20

Concentrations are in units of micrograms per liter (ug/l). Values reported as "non-detect" shall equal one half of the detection limit for purposes of computing a time weighted monthly average.

For chemicals where the detection limits are greater than the discharge limitation, "non-detect" will deem the discharge in compliance. All values that are detected below the Practical Quantification Limit (PQL), but above the Method Detection Limit (MDL), shall be reported as "trace." Values reported as trace shall be assumed to be the average of the MDL and PQL for determination of monthly averages.

### Monitoring Requirements

Aerojet shall sample, consistent with QA/QC Guidance, all monitoring wells in the American River Study Area (ARSA) and public water supply wells quarterly, beginning not later than thirty (30) days after the effective date of this Order, for the chemicals listed below. ARSA monitoring wells may be incorporated into the ongoing Aerojet Monitoring Program.

## Public Water Supply Wells in the ARSA

<u>State Well Number</u>	<u>Owner</u>	<u>Well Designation</u>
9N/7E-F1	Fair Oaks Water District	Chicago Well
9N/6E-12-Q1	Fair Oaks Water District	Town Well

Aerojet will also sample, consistent with QA/QC Guidance, all extraction wells and treatment plant effluent, at a frequency determined by the Monitoring Plan required by this Order.

Aerojet shall report sampling results within sixty (60) days after analysis of all the samples collected in a given quarter.

If any chemical listed below is found as a result of the monitoring required in a concentration equal to or greater than the detection limit specified for that chemical, Aerojet shall notify EPA and the State, within five business days following initial detection of the chemical.

<u>Chemical Name</u>	<u>PQL</u>	<u>Method</u>
Trichloroethylene	0.5	601, or equivalent in 8000 or 500 series
Tetrachloroethylene	0.5	601, or equivalent in 8000 or 500 series
1,1,1-Trichloroethane	0.5	601, or equivalent in 8000 or 500 series
Trichlorotrifluoroethane	0.5	601, or equivalent in 8000 or 500 series
1,1-Dichloroethylene	0.5	601, or equivalent in 8000 or 500 series
Trans, -1,2-Dichloroethane	0.5	601, or equivalent in 8000 or 500 series
1,2-Dichloroethane	0.25	601, or equivalent in 8000 or 500 series
Chloroform	0.5	601, or equivalent in 8000 or 500 series
Vinyl Chloride	0.25	601, or equivalent in 8000 or 500 series
N-Nitrodimethylamine	0.15	625, or equivalent in 8000 or 500 series
Freon-113	1.0	601, or equivalent in 8000 or 500 series
Carbon Tetrachloride	0.25	601, or equivalent in 8000 or 500 series
1,4-dioxane	10	524.2, or equivalent in 8000 or 500 series
Sulfonamide	10	625, or equivalent in 8000 or 500 series
Pyrrolidinone	10	625, or equivalent in 8000 or 500 series